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PERMITTING & COMPLIANCE

Montana Department of ENVIRONMENTAL QUALITY

WATER PROTECTION BUREAU

Agency Use	
Permit No.:	MTG010225
Date Rec'd	4/30/12
Rec'd By	PD

FORM
NMP

Nutrient Management Plan

READ THIS BEFORE COMPLETING FORM: Before completing this form (Form NMP), Concentrated Animal Feeding Operation (CAFO) operators need to read the General Permit, particularly Part IV.A. CAFO operators also need to read the "Instructions For Filling Out Form NMP," found at the back of the Form. Form NMP is intended to help CAFO operators develop a site-specific Nutrient Management Plan, in compliance with Part IV.A of the General Permit and all applicable State rules and statutes. Your Nutrient Management Plan must be maintained at the site as required in Part III of the General Permit. Sections B and C on your Form NMP must state the information exactly the same way as it was stated on the most recently submitted version of your Form 2B. Attach additional pages as necessary, indicating the corresponding section number on this NMP form. For additional help in filling out this form please read the attached instructions. The 2008 General Permit, current fee schedule, and related forms are available from the Water Protection Bureau at (406) 444-3080 or http://www.deq.mt.gov/wqinfo/MPDES/CAFO.asp

Section A - NMP Status *(Check one):*

☐ New — No prior NMP submitted for this site.

☑ Modification — Change or update to existing NMP.

Permit Number: MTG010225 (Specify the permit number that was previously assigned to your facility.)

Section B - Facility or Site Information:

Site Name Dairyland Farms Inc

Site Location 8560 Kimm Rd

Nearest City or Town Manhattan County Gallatin

Section C - Applicant (Owner/Operator) Information:

Owner or Operator Name Dairyland Farms Inc

Mailing Address 8560 Kimm Rd

City, State, and Zip Code Manhattan Mt. 59741-8425

Phone Number 406 282 7554 cell 406 451 4597

Section D - NMP Minimum Elements:

1. Livestock Statistics

Animal Type and number of animals	*# of Days on Site (per year)*	*Annual Manure Production (tons, cu. yds.or gal)*
1. dairy cows milking 590	365	
2. dairy cows dry 75	365	2400 Tons
3. dairy heifers 160	365	
4.		
5.		
6.		
7.		
8.		

Method used for estimating annual manure production:

Number of Acres covered by spreading dry manure = 80 Acres x 30 Ton per Acre = 2400 Tons

Liquid manure measured by custom applicator meter

2. Manure Handling

Describe manure handling at the facility:

Manure produced by dry cows and heifers is hauled and spread with conventional manure spreader

Manure produced by milking cows is pumped and injected by custom applicator twice annually

Frequency of Manure Removal from confinement areas:

Fall and winter - bi-monthly

May thru September - stockpiled and spread in Fall

Is this manure temporarily stored in any location other than the confinement area? ☐ Yes ☒ No

If so then how and where?

Is manure stored on impervious surface? ☒ Yes ☐ No

If yes, describe type and characteristics of this surface:

concrete or clay type soil or gravel pads

3. Waste Control Structures

Waste Control Structure (name/type)	*Length (ft)*	*Width (ft)*	*Depth (ft)*	*Volume (cubic ft or gallons)*
1. lagoon				6,700,000 gal
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

4. Disposal of Dead Animals

Describe how dead animals are disposed of at this facility:

composted - large animal

5. Clean Water Diversion Practices

Describe how clean water is diverted from production area:

diversion ditch around facility and around lagoon to divert clean water

6. Prohibiting Animals and Wastes from Contact with State Waters

Describe how animals and wastes are prohibited from direct contact with state waters:

fenced off
animals not allowed access to state water

Describe how chemicals and other contaminants are handled on-site:

fly bombs stored in cabinets

8. Best Management Practice (BMPS)

Describe in detail all temporary, permanent and structural Best Management Practices (BMPs) which will be used to control runoff of pollutants from facility's **production area**. Indicate the location of these measures. Include a schedule for implementation of each of these measures. Examples of BMP measures could include but are not limited to: constructing ditches, terraces, and waterways above an open lot to divert clean water run on; installing gutters, downspouts and buried conduits to divert roof drainage; providing more roofed area; decreasing open lot surface area; repairing or adjusting water systems to minimize water wastage; using practical amounts of water for cooling purposes; recycling water if practical and applicable.

Describe in detail all temporary, permanent and structural Best Management Practices (BMPs) which will be used to control runoff of pollutants from facility's **land application area**. Indicate the location of these practices. If not already in use, include a schedule for implementation of each of these measures. Attached details and specifications may be used to supplement this description. Examples of BMP measures could include but are not limited to: maintaining setbacks from surface waters for manure applications; managing irrigation practices to prevent ponding of wastewater on land application sites; never spray irrigating wastes onto frozen ground; consulting with the Department prior to applying any liquid waste to frozen or snow-covered ground; applying wastes at agronomic rates.

Plant sampling/tissue analysis	yes(no)	Rotational grazing	yes(no)
Conservation or reduced tillage	yes(no)	Manure injection or incorporation	(yes)/no
Terraces or other water control structures	yes(no)	Contour plantings	yes(no)
Riparian buffers or vegetative filter strips	yes/no	Winter "scavenger" or cover crops	yes(no)

Other examples _____

_____

_____

9. Implementation, Operation, Maintenance and Record Keeping – Guidance

The permittee is required to develop guidance addressing implementation of NMP, proper operation and maintenance of the facility, and record keeping as described in Part II of the permit.

Has a guidance document been developed for the facility? (Yes) No

Certify the document addresses the following requirements:

Implementation of the NMP:	(Yes)	No
Facility operation and maintenance:	(Yes)	No
Record keeping and reporting:	(Yes)	No
Sample collection and analysis:	(Yes)	No
Manure transfer:	(Yes)	(No)

Provide name, date and location of most recent documentation:

_____

_____

_____

If your answer to any of the above question is no, provide explanation

_____

_____

Section E – Land Application

Will manure be land applied to land either owned, rented, or leased by the owner or operator of the facility?

No If no, then provide an explanation of how animal waste at this site are managed.

(Yes) If yes, then the information requested in Section E must be provided.

Photos and/or Maps

Attach an aerial photograph or map of the site where manure is to be applied. (Use multiple photos/maps if necessary to show required details.) The photo(s)/map(s) must be printed on no larger than an 11"x17" piece of paper, and must clearly identify the following items:

- Individual field boundaries for all planned land application areas
- A name, number, letter or other means of identifying each individual land application field
- The location of any down-gradient surface waters
- The location of any down-gradient open tile line intake structures
- The location of any down-gradient sinkholes
- The location of any down-gradient agricultural well heads
- The location of all conduits to surface waters
- The specific manure/waste handling or nutrient management restrictions associated with each land application field.
- The soil type(s) present and their locations within the individual land application field(s)
- The location of buffers and setbacks around state surface waters, well heads, etc.

Land Application Equipment Calibration

Describe the type of equipment used to land apply wastes and the calibrating procedures:

flow meter for liquid manure injection

Manure Sampling and Analysis Procedures

A representative manure sample will be analyzed a minimum of once annually for Total Nitrogen, and Total Phosphorus. Analysis results will be reported in lbs/ton or lbs/1,000 gal. Results of these analyses will be used in determining application rates for manure, litter, and process wastewater.

Manure Sample collection will occur according to the following method:

The recommended method(s) found in Section 5 of Department Circular DEQ 9

Other (describe) HKM

Soil Sampling and Analysis Procedures

A representative soil sample from the top 6 inch layer of soil in each field will be analyzed for phosphorus content at least once every five years. Analyses will be conducted by a qualified laboratory, using the Olsen P test. Results will be reported in parts per million (ppm) and will be used in determining application rates for manure, litter, and process wastewater.

Soil sample collection will occur according to the following method:

The recommended method(s) found in Section 5 of Department Circular DEQ 9

Other (describe) HKM

Land Application Data-Narrative approach

The following must be filled out for each field to which manure, litter or process wastewater will or may be applied for the period of the permit (5 years). Use as many sheets as necessary to fulfill this requirement. **Fields with identical crops and soil types may be grouped together.**

Crops and Manure	
Field Name and spreadable acres for each (for fields with identical crops and soils type):	492 Acres
Crop 1 (year 1 or ?) plant species	Spring Wheat
Irrigated (Y/N)	Yes
Yield Goal (ton/ac or bushel/ac)	100 bu. per acre
N Content of soil as nitrate (lbs/acre or ppm)	
P Content of soil as P_2O_5 (lbs/acre or ppm)	
Time of Year When Application will Occur (month)	1/2 in October 1/2 in April
Application frequency (per year by month)	
Form of manure (liquid/solid)	liquid
Method of Application	custom injector
Is manure incorporated or broadcast?	incorporated - injected
Frequency of Application (yearly, biannual, etc.?)	yearly
Crop 2	Corn 30 Acres
Irrigated (Y/N)	Yes
Yield Goal (ton/ac or bushel/ac)	20 Ton Silage
N Content of soil as Nitrate (lbs/acre or ppm)	
P Content of soil as P_2O_5 (lbs/acre or ppm)	
Time of Year When Application will Occur (month)	October
Application frequency (per year, by month)	1 time per year
Form of manure (liquid/solid)	liquid
Method of Application	custom injector
Is manure broadcast, injected or incorporated?	injected
Frequency of Application (Annual, Biannual, ,etc?)	Annual

Phosphorus Risk Assessment

The permittee shall assess the risk of phosphorus contamination of state waters. An assessment shall be conducted for each field, under the control of the operator, to which manure, litter or process wastewater will or may be applied. If a new field is added in the future, then the permittee must submit a revised (modified) NMP. The permittee has the option of using either Method A or Method B (below) to complete the assessment. Copies of all tables and calculations used to complete the assessments, as well as the results of the assessments, shall be submitted to the Department and copies shall be maintained on-site at the facility and available for Departmental review. The results of the assessments shall be used to determine the appropriate basis for land application of wastes from the facility.

Method Used

Indicate which method will be used to determine phosphorus application:

Method A – Representative Soil Sample
Method B – Phosphorus Index

Method A – Representative Soil Sample

a) Obtain one or more representative soil sample(s) from the field.
b) Have the sample analyzed for Phosphorus by a qualified lab. The "Olsen P test" must be used for the analysis, and the result must be reported in parts per million (ppm).
c) Using the results of the Olsen P test, determine the application basis according to the Table below

Soil Test	
Olsen P Soil Test Result (ppm)	***Application Basis***
<25.0	Nitrogen Needs Of Crop
25.1 - 100.0	Phosphorus Needs Of Crop
100.0 - 150.0	Phosphorus Needs up to Crop Removal Rate
>150.0	No Application

Method B – Phosphorus Index

a) Complete a Phosphorus Index according to for each crop grown on each field. Complete table in Appendix A to calculate phosphorus index. For information on filling out specific sections Appendix A, please refer to Attachment 2 of Department Circular DEQ 9.
b) Using the calculated Total Phosphorus Index Value, assign the overall site/field vulnerability to phosphorus loss according to the table below.

Total Phosphorus	
Total Phosphorus Index Value	***Site Vulnerability to Phosphorus Loss***
<11	Low
11-21	Medium
22-43	High
>43	Very High

c) Using the calculated Site Vulnerability to Phosphorus Loss, determine the appropriate application basis according to the table below.

Site Vulnerability to Phosphorus Loss	
Site Vulnerability to Phosphorus Loss	***Application Basis***
Low	Nitrogen Needs
Medium	Nitrogen Needs
High	Phosphorus Need Up to Crop Removal
Very High	Phosphorus Crop Removal or No Application

d) The permittee will complete the *Nutrient Budget Worksheet*, below, for each crop grown on each field to which manure or process waste water is or may be applied during the first year of application. A copy of each Nutrient Budget Worksheet will be maintained on site, and a copy will be submitted to the Department.

Nutrient Budget Worksheet

Site/Field:

	Nutrient Budget	***Nitrogen-based Application***	***Phosphorus-based Application***
	Crop Nutrient Needs, lbs/acre included in Department Circular DEQ 9		
(-)	Credits from previous legume crops, lbs/acre (from DEQ-9), as applicable		
(-)	Residuals from past manure production, lbs/acre (lbs/acre applied in previous year(s) x fractions listed in DEQ-9)		
(-)	Nutrients supplied by commercial fertilizer and Biosolids, lbs/acre		
(-)	Nutrients supplied in irrigation water, lbs/acre		
	= Additional Nutrients Needed, lbs/acre		
	Total Nitrogen and Phosphorus in manure, lbs/ton or lbs/1,000 gal (from manure test)		
(x)	Nutrient Avalability factor (for Nitrogen based application see DEQ-9, below; for Phosphorus based application use 1.0)		
	= Available Nutrients in Manure, lbs/ton or lbs/1,000 gal		
	Additional Nutrients needed, lbs/acre (calculated above)		
(/)	Available Nutrients in Manure, lbs/ton or lbs/1,000 gal (calculated above)		
	= Manure Application Rate, tons/acre or 1,000 gal/acre		

Comments:

An average of approximately 24000 gallons of liquid manure was injected by custom applicator on 452 Acres of Spring wheat and corn. This was applied only once per acre. Approximately 226 acres done in October of 2010 the other 226 Acres done in first week of April, 2011.

for rates & needs refer to pages 17, 18, and 26 in HKM manual dated October 2006

Section F - CERTIFICATION

Permittee Information:

This Form NMP must be completed, signed, and certified as follows:

- For a corporation, by a principal officer of at least the level of vice president;
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Permittees Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)	
Delbert Kamerman	
B. Title (Type or Print)	**C. Phone No.**
President	282-7554
D. Signature	**E. Date Signed**
Delbert Kamerman	4-26-12

Return the Form NMP, Nutrient Management Plan to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

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Lewis
PERMITTING & COMPLIANCE DIV.

DAIRYLAND FARMS INC. OPPERATIOIN OVERVIEW

Dairyland Farms Inc. is a private family owned farming and dairy operation in the Churchill area south of Manhattan, Montana. The farm is approximately 1,100 acres in size and 855 acres are farmed. The remaining acreage is pasture land, roads, farm-yards and building sites. The farm address is 8560 Kimm Road, Manhattan, Montana 59741

Following is the design criteria for new and replacement systems at Dairyland Farms Inc. (See Figure 1 and 2). Figure 1 is a 1995 aerial photo and Figure 2 is the 1992 USGS 7.5 minute topographic map of the same area. Both Figures are at a scale of 1-inch equaling 1000 feet and show the farms location and other pertinent features required by this permit.

This design is according to Montana Department of Environmental Quality (MDEQ) Circular- 9. In addition, this design is for less than 700 mature dairy cows, which according to DEQ-9 is a medium size Confined Animal Feeding Operation (CAFO). Several components including the waste storage lagoon have been designed for larger capacity than a medium CAFO in the event that the dairy operation is expanded in the future. The new dairy consists of:

- A double 20 milking parlor, milk storage tank and all ancillary milking equipment.
- Enclosed holding pens, vet pens, post and pre-fresh cow pens, treated cow pens, maternity pen, and vet pens.
- Free Stall loafing shed.
- An underground dairy waste collection system.
- Waste storage lagoon.

All the mature milking cows will be permanently located inside the new loafing sheds. Heifers, and calves will be housed in existing open lots and sheds. Waste collection and disposal in the new facility will primarily be a scrape operation, utilizing only as much water for wash down as necessary. Waste will be stored in the lagoon and spread on owned farm ground in the summer and fall months of the year.

Waste collection, containment and disposal in the existing open lots and sheds will be continued as in the past and according to "best management practices". Collection and disposal consists of stock piling straw and animal waste in elevated areas and periodic loading hauling and spreading of these stockpiles. Containment of the existing open lots will also continue as in the past, which includes: berms to control and direct off-site runoff around the open lots; and, buffers, set backs and grass filters that capture any runoff inside the open lots.

DAIRYLAND FARMS INC. DESIGN CRITERIA

Following are the design criteria, which are presented in accordance with DEQ-9.

Section 1: Animal Waste Management System Design

To meet the effluent limitations for a Medium CAFO, the following criteria for the design volume of the waste control structure(s) have been addressed.

- Storage period;
- Accumulated waste during storage period;
- Normal precipitation and evaporation during the storage period;
- Normal runoff during the storage period;
- Direct precipitation from a *25-year, 24-hour* (or *100-year, 24-hour*) rainfall event;
- Residual solids after liquid has been removed;
- Necessary freeboard to maintain storage integrity; and
- Minimum treatment loading, if applicable.

A. COLLECTION

A.1 Existing Facilities

Collection, containment and disposal of waste from the existing open lots and sheds will be continued as in the past and according to "best management practices". According to Mr. Kamerman, experience has shown that no runoff occurs from the exiting open lots and that the existing structures have been able to carry peak flows around and away from the open lots including a *25-year, 24-hour* rainfall event. Consequently structures have not been designed to maintain these existing facilities and it is planned to continue to utilize the current practices. In addition, to divert off-site storm runoff around these facilities, the existing ditches, dikes, and berms will continue to be used and only enhanced when and if necessary.

Collection of the waste at the existing facilities will (and currently does) consists of stock piling straw and animal waste in elevated areas of the open lots. Periodically throughout the summer and fall months, these stock piles are loaded and hauled away to nearby (owned) farm and pasture ground.

A.2 New Facility

Ditches, dikes, and berms will be used to divert storm runoff and snowmelt around and away from the lagoon. Only dairy waste from inside the new facility, and rain or snow directly onto the inside edge of the lagoon will end up in the lagoon.

Collection for the new facility will utilize an underground 30" HDPE pipe beneath the central alley of the new facility. (See Sheet C-1). At strategic positions, grated vertical drop structures will be used to transport waste into this collection pipe. As needed, (daily or weekly) waste will be scraped along alley-ways into these drop structures where it will flow down and away to the lagoon.

Approximately ½ way to the lagoon, a 20 foot by 20 foot by 20 foot deep concrete temporary collection and recirculation tank will be installed. There are several uses for this structure. First, (if and only when needed) the waste can be pumped from this tank back up through a 10" PVC return line to the beginning of the 30" HDPE collection line to circulate waste and assist in washing down solids if necessary. Second, waste can be pumped from this tank directly into a manure spreader for hauling away or into a traveling gun type system that may be installed in the future. Third, the waste can just pass through the tank and on to the lagoon.

B. WASTE STORAGE STRUCTURE

B.1 Location

Neither the new or existing storage structures nor wastewater disposal sites are located within state waters.

According to on-site and nearby well logs the depth to groundwater is at least 150 feet below the floor of the new lagoon. In addition, 20 foot deep test pits excavated at the lagoon site show no indication of groundwater. These test pits also showed no bedrock within 10 feet of the lagoon bottom.

The nearest existing water well is approximately 950 feet away from the new lagoon, which is the only wastewater containment structure on the site. All manure is disposed on owned crop or pasture land according to "best management practices" and the attached Nutrient Management Plan. These disposal areas have been in use since long before October 1, 1993.

The new lagoon is not within the 100 year flood plain. The nearest natural surface water feature is Godfrey Creek, which is approximately 3,800 feet away (due west) and approximately 120 feet lower in elevation than the lagoon.

B.2 Ground Water Protection

The new lagoon will utilize a 40 mil (1 mm) HDPE liner. (See the attached Liner information).

B.3 Volume Capacity

New Lagoon

B.3.1 Liquid and solid manure and process-generated wastewater volumes are according to Table 1: DEQ-9 for mature 1400 lb lactating cows.

Animal Waste	640 lactating cows x 18.7 gpd= 11,968 gpd
Process Water & Other Waste	640 lactating cows x 30 gpd[1] = 19,200 gpd
TOTAL WASTE PRODUCTION PER DAY	= 31,168 gpd

[1]This volume is according to Kessler Dairy Supply of Westfailia / Surge and several other dairy experts involved in the design of the dairy parlor, holding pens, and wash down systems.

Note: This volume includes wash down water, bedding, and wasted feed.

B.3.2 The structure will not receive runoff from lots or pens or roofs of the new structure.

B.3.3 According to rainfall records at the Belgrade airport, the average rainfall is 13.8 inches per year; and, according to the Mean Annual Shallow Lakes and Reservoirs Evaporation map provided in DEQ-9, the mean annual evaporation rate is 35 inches per year. Therefore there is a net loss of 21.2 inches per year due to evaporation. To be conservative, this loss has not been accounted for in sizing the lagoon.

B.3.4 According to DEQ-9 the 25-year, 24-hour precipitation for this area is 2.2 inches. Since no storm runoff from surrounding areas will enter the lagoon, the amount of height set aside for a 25-year, 24-hour precipitation event is 2.2 inches.

B.3.5 The lagoon will not be anaerobic, naturally aerobic or mechanically aerated. Prior to pumping and emptying, the lagoon will be mechanically stirred until desired consistency is gained for optimum pumping and land application disposal.

B.3.6 The floor of the lagoon will be sloped to minimize the amount of material not removed during pumping, (residual). To account for this, the bottom 1.5 feet of the lagoon equaling approximately 115,600 gallons has been set aside for residual.

B.4 Design Characteristics

Lagoon Capacity Design Criteria (See Sheet C-1 and D-1).

Rim elevation (site datum)	62 feet
Emergency overflow bottom elevation (site datum)	61 feet
High water mark elevation (site datum)	60 feet,
Bottom elevation (site datum)	47 to 44 feet

Total Volume (bottom at 44 feet to high water mark at 60 feet)	6,740,235 gallons
Residual Storage (bottom 1.5 feet from 44 feet to 45.5 feet)	(75,500 gallons)
25-year, 24-hour precipitation (2.2 inches) (Worst case = top 2.2 inches of storage from 59'-9.8" to 60')	(115,600 gallons)
Total Available Volume For Waste	6,549,135 gallons
Daily Waste Production (see above)	31,168 gpd
Days of Available Storage	210 days

B.4 Design Characteristics

Both the inner and outer slopes of the lagoon structure are to have slopes of 1 vertical to 3 horizontal (1:3). (See Sheet C-1).

The downstream end of the lagoon will consist of an embankment / dike and must be constructed of relatively impervious soil and compacted to at least 90 percent Standard Proctor Density. Vegetation and other unsuitable materials must be removed from the area where the embankment is to be placed and all other "cut" areas.

The freeboard shall be from an elevation of 60 feet (high water mark) to an elevation of 61 feet (bottom elevation of the emergency spillway). (See Sheet C-1).

Calculations to accommodate the 25-year, 24-hour rainfall event and Residual are shown above.

The top of the embankment / dike has been designed to have a top width of 20 feet.

Ditches with erosion control structures (such as silt fences, straw bales, and vegetation) shall be installed as shown on the Sheet C-1. Rip Rap shall be installed into, through and down the entire length of the over flow structure. (See Sheet C-1).

According to Mr. Kamerman, little to no runoff ever occurs on the site (s). This is because of the relatively dry climate, low slopes, and silty sandy soils that readily absorb rain and snow melt. Consequently, calculations to estimate peak flows in diversion channels are not necessary and have not been conducted or provided.

C. WASTE TREATMENT LAGOON

Not applicable since this a waste storage lagoon only.

D. WASTEWATER TREATMENT STRIP

Not applicable since no Rapid Infiltration or Overland Flow treatment strips are planned or needed.

Section 2: Waste Production

Manure Production

Animal	Number	Daily Manure Production Per Animal(gallons)	Total Manure Production per day (gallons)	Annual Manure Production (gallons)
Mature Dairy Cows	640	18.7	11,968	4,368,320
Heifers	60	6.95	417	152,205
Calves	60	2.3	138	50,370
Total			12,523	4,570,895

Other Wastes

Process Water (See above)	19,200 gpd	7,008,000 gallons
Total Waste Production per year		**11,578,895 gallons**

OPERATION AND MAINTENANCE

Following is a brief outline of typical operation and maintenance procedures needed to properly manage the primary components of the waste control structures of the Dairy. This is only a partial list and should not be considered conclusive for the operation and maintenance of all components of the operation.

Waste Collection Structures

All structures including the 30" HDPE collection pipe, vertical drop structures, drop box grates, recirculation line, waste collection and pumping vault, buffers, setbacks, conservation tillage, grass filters, shall be continually monitored for optimal operation.

Mechanical components including pumps, power panels, and valves shall be positioned in safe locations, kept clean and readily accessible for inspection operation and maintenance. Lockouts shall be provided on all on/off switches and mechanical equipment to properly isolate and place it "off-line" during maintenance. Parts lists shall be maintained and readily accessible for easy tracking and replacement of equipment when needed.

All underground waste collection structures including the: manhole, 30" HDPE collection pipe, drop boxes, pump vault, and lagoon are not fit for human occupancy. In no case shall any of these structures be entered before proper procedures are followed. In the event that any of these structures must be entered, a Health and Safety Specialist shall be contacted and contracted for proper procedures to enter and work in these confined spaces.

Natural components including setbacks, buffers, and grass filters shall be continually maintained to provide optimal performance. Maintenance includes tillage, mowing, and periodic debris removal.

Storm Runoff Diversion Structures

Temporary sediment control structures such as silt fencing and / or straw bales shall be kept operational and switched out when necessary. Revegetation (with native grasses) of all disturbed areas shall be completed as soon as reasonably possible. Vegetation in all diversion structures shall be well maintained to ensure that soil erosion is minimal to none. Once established, the vegetation shall be maintained to provide optimal performance.

Waste Storage Structures

The lagoon and manure collection pump vault shall be isolated by fences and or cattle guards so that no dairy livestock or hooved wildlife can get into the lagoon or pump

vault. Fences and / or cattle guards shall be kept in good condition to keep animals out of these areas. Cattle guards shall be installed at all road/fence crossings into the lagoon area to eliminate the possibility for leaving gates open.

These structures are also not fit for human occupancy. In no case shall any of these structures be entered before proper procedures are followed. In the event that any of these structures must be entered, a Health and Safety Specialist shall be contacted and contracted for proper procedures to enter and work in these confined spaces.

The lagoon shall be inspected daily for any noticeable unexpected changes in waste level. In addition, the downstream side of the embankment / dike shall be inspected monthly for any sign of seepage. Diversion structures down the sides of the embankment / dike shall be maintained so that the embankment / dike itself is not eroded.

Waste Disposal

Waste shall be disposed according to the Nutrient Management Plan and "Best Management Practices". Heavily traveled areas and roadways shall be properly constructed and maintained by plowing and gravelling. This is particularly important for the roadways and pumping stations around the lagoon to ensure that heavy equipment does not come into contact with the liner.

NUTRIENT MANAGEMENT PLAN

NUTRIENT MANAGEMENT PLAN

USDA NRCS Natural Resources Conservation Service

Comprehensive Nutrient Management Plan

For:

Dairyland Farms, Inc.

8560 Kimm Rd
Manhattan, MT 59741
282-7554

Prepared in Cooperation with the:

USDA – Natural Resources Conservation Service

And

Gallatin Soil and Water Conservation District

[Right-click here to select field office address]

Approved Conservation Planner and Certified CNMP Specialist

As an Approved Conservation Planner, I certify that I have reviewed this CNMP for technical adequacy and that the elements of the CNMP are technically compatible, reasonable and implementable.

Signature: _____ Date: 9-13-06

Name:

Title: Approved Conservation Planner and CNMP Specialist

Owner/Operator

As the owner/operator of this CNMP, I certify that I, as the decision maker, have been involved in the planning process and agree the items/practices listed in each element are needed. I understand that I am responsible for keeping all the necessary records associated with the implementation of this CNMP. It is my intent to implement/accomplish this CNMP in a timely manner as described in the plan.

Signature: Robert Kanerman Date: 9-14-06

for Dairy land Farms

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SECTION 1
CNMP Purpose and Conditions

Purpose of the Comprehensive Nutrient Management Plan (CNMP)

The Comprehensive Nutrient Management Plan (CNMP) is a conservation system for your animal feeding operation. It is designed to address, at a minimum, the soil erosion and water quality concerns on your operation. The following soil erosion and water quality concerns have been identified on your farm:

Soil Erosion Concerns	Water Quality Concerns	Other Concerns Addressed
Sheet and Rill Erosion	Facility Wastewater Runoff	Maximize Nutrient Utilization
	Manure Runoff (Field Application)	Regulations
	Manure Runoff (From Facilities)	Time available for manure application

Nutrient Management Plan

This document serves as a Nutrient Management Plan (NMP) for purposes of satisfying the regulatory requirements for a MPDES permit and includes

- **Clean water management**
- **Implementation of conservation practices to control nutrient loss**
- **Manure and soil testing**
- **Land application methods**
- **Record keeping**
- Adequate Storage of Manure
- Proper Management of Mortalities
- Prevention of Animal Contact with Waters of the U.S.

Manure and Nutrient Management is managing the source, rate, form, timing, placement and utilization of manure, other organic by-products, bio-solids, and other nutrients in the soil and residues. The goal is to effectively and efficiently use the nutrient resources to adequately supply soils and plants to produce food, forage, fiber, and cover while minimizing the transport of nutrients to ground and surface water and environmental degradation.

Adoption of this plan and the practices described within, will prevent direct contact of animals and manure with state waters.

Nitrogen and Phosphorus vs. Water Quality

Nitrogen and Phosphorus are two nutrients that have the potential to impair the quality of our groundwater and surface water. Nitrogen leaching out the root zone may be transported to surface water or it may leach to the groundwater. The EPA Drinking Water Maximum Contaminant Level (MCL) for Nitrates is 10 mg/L. Phosphorus leachate, or runoff entering the surface water may contribute to excessive algae growth which may cause low oxygen levels in surface water. This in turn may impair aquatic life. This manure and nutrient management plan will help to protect groundwater and surface.

Conditions:

Manure Management Planner (MMP) estimates manure nutrient concentration and annual production by multiplying the number of animal units (1000 lbs of live weight) times the animal type's excretion data, then times the animal type's dilution factor and storage type's dilution factor. Adjustments are made if the animals are not present year-round or if not all the manure is collected or if dilution water is added to the manure or if bedding is added to the manure or if the feed ration reduces nutrient concentrations.

The State of Montana Water Quality Act, Section 75-5-605 (revised 1999), states that "It is unlawful to ... cause pollution ... of any state waters or to place or cause to be places any wastes in a location where they are likely to cause pollution of any state waters ...." Your CNMP provides the basic information on how the wastes produced from your operation, and/or applied on your fields, will be utilized. Following your CNMP will assist you in maintaining compliance with the Montana Water Quality Act and associated Department of Environmental Quality (DEQ) requirements.

Note: If the number of livestock change (10% or more), your fields change, your rotation changes, the method of storage changes, or if the method of application needs to be altered, contact the local NRCS field office and Montana Department of Environmental Quality office (if required) or your consultant to revise this plan.

Utilization of Excess Manure: If wastes will be utilized on land not controlled by you, documentation of how many tons and loads of manure are hauled off-site must be maintained (see Section 13).

SECTION 2
Emergency Response Plan

In Case of an Emergency Storage Facility Spill, Leak, or Failure:

Implement the following first containment steps and where containment material is located:

a. Stop all other activities to address the spill.
b. Use skid loader or tractor with blade to contain or divert spill or leak, if possible.
c. Call for help & excavator if needed.
d. Locate the containment material located at ( ).
e. Complete the clean-up and repair the necessary components.
f. Assess the extent of the emergency and determine how much help is needed.

In Case of an Emergency Land Application Manure/Waste Discharge

Implement the following first containment steps and where containment material is located:

a. Stop all other activities to deal with the emergency.
b. Call for help if needed.
c. Call sheriffs office if spilled on road for traffic control and clean the spill immediately from the road and roadside if needed.
d. Contain the spill or runoff from entering the stream or waterway using straw bales, saw dust, or soil material.
e. If flow is coming from a tile, plug the tile with a tile plug immediately.
f. Assess the extent of the emergency and determine how much help is needed.

1. Emergency Contacts:

Department / Agency	Phone
Fire Department	(406)
Emergency Squad	(406)

2. Available equipment/supplies for responding to emergency:

Equipment Type	Contact Person	Phone Number

3. Contacts to be made by farm's Owner or Operator as Soon As Possible within 24 hours:

Organization	Phone
Montana DEQ	
Montana EPA Emergency Spill Hotline	
County Health Department	
County Engineer	
County Sheriff's Office	

Provide the following information:

a. Your Name
b. Farm Identification
c. Description of emergency
d. Estimate of the amounts, area covered, and distance traveled.
e. Has manure reached surface waters or major field drains?
f. Is there any obvious damage: employee injury, fish kill, or property damage?
g. What is currently in progress to contain situation?

SECTION 3
Maps

SEE ATTACHED MAPS

SECTION 4
Manure and Wastewater Handling and Storage Component

(Include an aerial photo or sketch of the facilities / headquarters operation.)

Approved By:

Signature_____ **Date:**_____
Title:

Practice and Facility Management Plan

To control runoff of pollutants from the production area the following conservation practices and structural measures (BMP's) will be implemented to prevent direct contact with State Waters.

Planned Practices	Amount	Year of Installation

Not Needed at This Time

Operation and Maintenance

Mortality Management:

(Animal mortalities will be managed to ensure that they are not disposed of in a liquid manure, storm water, or process waste water storage or treatment system that is not specifically designed to treat animal mortalities)

Burial – Montana regulations require that carcasses must be buried at least 2 feet below the surface of the ground and at least 200 yards from any highway, road, waterway, or public property within 36 hours. Earth-moving equipment must be used to excavate a hole or trench for the carcasses. Drainage from the animal compositing area should be planned so as to protect surface and ground water sources. Before construction of any compositing site, all State, Federal, and Tribal regulations concerning the operation, required permits, site inspections, and drainage from the animal mortality area should be investigated.

Incineration – Animal carcasses will be burned under a controlled environment at very high temperature, reducing the carcass to ashes. Prior to incineration, state and local ordinances must be considered and any necessary permits required and required compliance are the producers' responsibility. Prior to completing this practice a Mortality Management plan will be developed with the producer by a mortality management specialist.

Licensed Off Farm Transfer – Rendering companies recycle animal carcasses into useful byproducts. Dead animals [specify type] will be hauled away by a licensed renderer or to a licensed landfill within 36 hours of animal mortality.

On Farm Composting – Dead animals [specify type] will be composted. Animals will be buried above ground in a bio-filter. Animals will be placed on a bed of (list carbon source) and covered and left to decay. An internal pile temperature of 132 degrees for at least 3 days will be generated to destroy pathogens. Select a site that is considerable distance from surface or groundwater sources. It may also be beneficial to locate facility away from human dwellings. Consider drainage of the site when deciding what type of compost facility to build. There should be no extraneous surface water contacting the compost area. Consider building clean water divbersions to handle clean runoff water. Prior to completing this practice a Mortality Management Plan will be developed with the producer by a mortality management specialist.

Manure and Wastewater Storage and Handling - Record Keeping (See Record Keeping - Section 13)

Animal and Manure Inventory.

Storage ID	Storage Type	Capacity	Units	Annual Collected	Days Storage
New Pond	Storage pond, <50% dilution	2,485,554	Gal	3,395,000	267

Storage Totals	Capacity	Units	Annual Collected
Liquid Manure	2,485,554	Gal	3,395,000

Animal ID	Type or Phase	Number	Weight	Confinement Period	% Coll.	Storage ID
Steers	Growing heifer/steer (dairy)	20	800	Jan Early - Dec Late	50	New Pond
Weaned	Weaned heifer/steer (dairy)	40	500	Jan Early - Dec Late	50	New Pond
Calves	Calf (dairy)	20	200	Jan Early - Dec Late	100	New Pond
Heifers	Breeding heifer (dairy)	60	1000	Jan Early - Dec Late	100	New Pond
Dry	Dry cow (dairy)	60	1200	Jan Early - Dec Late	100	New Pond
Milkers	Milk cow (dairy)	500	1400	Jan Early - Dec Late	50	New Pond

Estimated time required to apply manure produced at the operation annually.

Storage ID	Annual Collected	Units	Loads	Time Needed to Empty
New Pond	3,395,000	Gal		

SECTION 5
Land Treatment Component

Sites Proposed for Land Application - See Maps in Section 2

Approved By:

Signature_____ **Date:**_____
Title:

Planned Land Treatment:

Planned Structural and Management Practices and Implementation Schedule.

The following conservation practices (BMP's) will be implemented to control runoff of pollutants to state waters from land application areas:

Practice Name	Tract # / Field #	Planned Amount (Number, Acres, or Feet)	Year Planned to be Applied / Installed
Residue Management, Seasonal Manage amount, orientation and distribution of organic residue to maximize soil protection until immediately prior to planting the following crop. • The ( ) crop residue will be maintained @ ( ) % ground cover until seedbed preparation in the spring for the ( ) crop.	all	855	Already installed
Conservation Crop Rotation Grow crops in a planned rotation for biodiversity and to provide adequate amounts of organic material for erosion reduction, nutrient balance and sustained soil organic matter. • The following rotation(s) are planned for the designated fields: • Fields (all) - Rotation (alfalfa/samll or large grain)	all	855	Already installed
Waste Utilization Use organic waste material in an environmentally safe manner to enrich soil fertility. • See the enclosed "Nutrient Management Plan" for the proper manure application rates, timing, and methods of application to provide needed crop nutrients and to minimize the transport of nutrients to ground and surface water.	all	855	April 2007

SECTION 6
Nutrient Management Component
Nutrients (Manure, Wastewater, and Commercial Fertilizers)

Approved By:

Signature_____ **Date:**_____
Title:

Soil Testing Plan
Soil test will be taken every 3-5 years. Soil tests will be taken after harvest.

Soil Testing Procedures

Soil samples for soil tests should not represent more than 40 acres. The fields will be sub-divided into similar planning units for soil sampling and nutrient planning purposes. Soil sampling depth for P and K shall be 6-12 inches. Under no till conditions pH should be tested using the top 4 inches only.

Soil samples shall be collected and prepared according to Montana State University guidance or standard industry practice. Soil test analysis shall be performed by laboratories recognized by Montana State University as conducting certified soil analysis. Phosphorous tests must be "Olsen" tests. Avoid taking soil test sample within 9 months after a manure application.

Soil testing shall include analysis for any nutrients for which specific information is needed to develop the nutrient plan. Request analyses pertinent to monitoring or amending the annual nutrient budget, e.g. pH, soil organic matter, nitrogen, phosphorus, and potassium. The minimum soil analysis for Montana is to include: pH, phosphorus, potassium, nitrate-nitrogen, E.C. (electro-conductivity), and O.M.(organic matter).

Manure and Wastewater Testing/Analysis Plan
Manure shall be analyzed on an annual basis from each storage structure for: % Solids or % moisture, Total N, NH_4 or NH_3, P_2O_5, K_2O, and pH.

Nitrogen and Phosphorus Risk Assessment

Field	Subfield	P Soil Test Risk	P Index Risk	N Leaching Risk
6		Medium	Low	Low
11		Medium	Low	Low
12		Medium	Low	Low
4		Low	Low	Low
7		Low	Low	Low
8		Low	Low	Low
9		Low	Low	Low
10		Low	Low	Low
13		Low	Low	Low
14		Low	Low	Low
15		Low	Low	Low
16		Low	Low	Low
17		Low	Low	Low
18		Low	Low	Low
19		Low	Low	Low
20		Low	Low	Low
21		Low	Low	Low
1		Low	Low	Low
2		Low	Low	Low
3		Low	Low	Low
5		Low	Low	Low

Generalized Interpretation of Phosphorus Ratings & Management

LOW – This site has a low potential for P movement from the site. If farming practices are maintained at the current level there should be a low probability of an adverse impact to surface resources.

MEDIUM – This site has a medium potential for P movement from the site. There is a greater probability of an adverse impact to surface water resources than from a low rated site. Some remedial action such as using P management measures (i.e. filter strips, grassed waterways, application setbacks, manure injection or incorporation) should be taken to lessen the probability of P movement.

HIGH – This site has a high potential for P movement from the site. There is a higher probability of an adverse impact to surface water than medium sites unless remedial action is taken. Soil and water conservation (refer to soil erosion category for conservation options) as well as P management measures (i.e. P based manure application rates) should be taken to reduce the risk of P movement and probable water quality degradation.

VERY HIGH – This site has a very high potential for P movement from the site. There is a very high probability for an adverse impact to surface water. Remedial action should be taken to reduce the risk of P movement. Soil and water conservation practices and a phosphorus management plan are needed to reduce the potential of water quality degradation.

Practices utilized to reduce P loss can vary from one site to the next. Site categories that have the highest weighted risk value are the most critical factors impacting P loss. Practices that reduced the risk value of these categories are the most effective.

Effective practices can include: P management measures such as planting high P-use crops, rotating manure application sites, reduced manure application rates, manure application set-backs from areas where runoff concentrates, application method (injection or incorporation versus broadcast), timing (growing season, spring and split applications versus fall or applications to frozen/snow covered ground), and soil and water conservation practices such as residue management, terraces, contouring, grassed waterways, filter strips, etc.

Non-Permitted Facility (AFO)
Minimum Setback Distances from Sensitive Areas (see map for locations)

Operation	Type of Sensitive/Setback Area					
	Grassed Waterways [1, 2]	Residences	Active or Inactive Wells	Mines, Quarries, Sinkholes [2]	Ponds/Lakes	Surface inlets, Streams, Ditches
Beef/Veal	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.
Dairy	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.
Hog	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.
Chicken/Turkey	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.
Duck	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.
Horse/Sheep	35 ft.	100 ft.	100 ft.	100 ft.	25 ft.	25 ft.

[1] Do not apply manure to establish a grassed waterway
[2] That are a direct conduit to ground water or receiving surface runoff

Permitted Facility (CAFO)
Minimum Setback Distances from Sensitive Areas

Operation	Type of Sensitive/Setback Area					
	Grassed Waterways	Residences	Active or Inactive Wells	Mines, Quarries, Sinkholes	Ponds/Lakes	Surface inlets, Streams, Ditches
Beef/Veal	35 ft.	100 ft.	500 ft.	100 ft.	100 ft.	100 ft.
Dairy	35 ft.	100 ft.	500 ft.	100 ft.	100 ft.	100 ft.
Hog	35 ft.	100 ft.	500 ft.	100 ft.	100 ft.	100 ft.
Chicken/Turkey	35 ft.	100 ft.	500 ft.	100 ft.	100 ft.	100 ft.
Duck	35 ft.	100 ft.	500 ft.	100 ft.	100 ft.	100 ft.
Horse/Sheep	35 ft.	100 ft.	500 ft.	100 ft.	25 ft.	25 ft.

[1] Do not apply manure to establish a grassed waterway
[2] That are a direct conduit to ground water or receiving surface runoff

NOTE: **For vegetated buffers**: The CAFO may substitute the 100-foot setback with a 35 foot-wide vegetated buffer where applications of manure, litter, or wastewater are prohibited. Also, the CAFO may demonstrate that a buffer is not necessary because of implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100-foot setback.

SPECIAL MANURE APPLICATION CRITERIA:

Winter Application

Application of wastes to frozen and snow covered soil.

Application on frozen and snow covered soil is not recommended. However, if manure application becomes necessary on frozen or snow covered soils, only limited quantities of manure shall be applied to address waste storage limitations until non-frozen soils are available for manure application. These situations need to be documented in the CNMP and in the producer records. If winter application becomes necessary, applications are to be applied only if ALL the following criteria are met:

- Application rate is limited to 10 wet tons/acre for solid manure more than 50% moisture and 5 wet tons for manure less than 50% moisture. For Liquid manure or process wastewater is not allowed to be sprayed on frozen ground.
- Applications are to be made on land with at least 90% surface residue cover (e.g. good quality hay or pasture field, all corn grain residue remaining after harvest, all wheat residue cover remaining after harvest).
- Utilize those areas for manure application that are furthest from streams, ditches, waterways, surface water, etc (areas that present the least runoff potential and are furthest from surface water).
- Increase the application setback distance to 200 feet "minimum" from all grassed waterways, surface drainage ditches, streams, surface inlets, water bodies. This distance may need to be further increased due to local conditions.
- Additional winter application criteria for fields with significant slopes more than 6% (fields exceeding 6%) are to be identified in the CNMP. Manure shall be applied in alternating strips 60 to 200 feet wide generally on the contour, or in the case of contour strips on the alternating strips.
- If Winter application is unavoidable, contact DEQ prior to application so that DEQ may review buffer zone requirements with the producer.

Manure Application on Steep Fields

Manure application should **not** be completed on fields where RUSLE2 soil loss prediction is greater than soil loss tolerance (T) or on fields with a slope greater than 9%.

Manure Application on Fields Subject to Flooding

Not Applicable

General Liquid Manure Applications

For liquid wastes, the application rate is to be adjusted to the most limiting factor to avoid ponding, surface runoff, subsurface drainage (tile) discharge, the nutrient needs of the field, or the nitrogen or phosphorus risks for the field. The total application is not to exceed the field capacity of the upper eight inches of soil. The actual application rate shall be adjusted during application to avoid ponding or runoff. Bare/Crusted soils may require some tillage to improve infiltration.

Manure Application on Fields with "Systematic Surface Drainage"

Criteria for Systematic Surface Drained Fields:

- Fields or areas of fields that have systematic "surface drainage" systems (e.g. shallow surface drains spaced 100 – 200 feet apart). These "internal" surface drains are considered concentrated flow areas. However, if special precautions are taken, manure can be applied in the surface drains with minimal risk of surface runoff. THIS DOES NOT APPLY TO THE COLLECTOR SURFACE DRAINS (mains) OR DRAINS BORDERING THE FIELDS. The following special manure application techniques shall be used:
- Till the surface at least 3 to 5 inches deep prior to liquid manure surface application. For SOLID manure till either prior to application or incorporate within 24 hours. This can be done with a heavy disk, chisel plow, plow, field cultivator, AERWAY tool, or similar tool that can provide "full-width" soil disturbance to a depth of 3-5 inches.
- Surface apply the liquid manure uniformly over the entire soil surface on the freshly tilled soil. The purpose of the surface application on the freshly tilled soil is to allow the liquid manure to be soaked/absorbed into the entire 3-5 inches of loose soil surface.
- For fields that have no subsurface drainage, the liquid manure can be injected directly with no prior tillage.
- Limit LIQUID application rates to 13,000 gallons per acre or less per application.

Minimum Ground Cover for Manure Applications

Medium Phosphorus Risk Fields

- The fields shall have at least 30% ground cover at the time of application or the manure or other organic by-products shall be incorporated within one week.

High Phosphorus Risk Field

- The field shall have at least 50% ground cover at the time of application unless the manure is incorporated within 4 days on areas with < 50% cover.

Estimated Manure Nutrient Analysis

Storage ID	Avail. N	P2O5	K2O5	Units	Source
New Pond	9.0	8.3	14.8	Lb/1000 Gal	Book

Manure Application Plan

Notes and Assumptions:

- **Avail. N*** is the estimated amount of nitrogen remaining after losses due to application method and timing.
- When liquid manure is applied to fields with tile, drainage tile plugs (or similar devices) shall be available on-site to plug tile outlets should manure begin to flow from the tile outlets.

Year	Month	Field	Subfield	Acres	For Crop	Yield	Manure Source	Equipment	Incorp	Rate/A	Based On	Loads/A	Avail. N*	P2O5	K2O
2007	Apr	13		20.6	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2007	Apr	14		21.7	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2007	Oct	17		36.3	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2007	Oct	21		36.5	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2008	Apr	5		51.8	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2008	Oct	11		47.4	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2009	Apr	7		22.3	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2009	Apr	8		21.3	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2009	Apr	9		26.7	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2009	Oct	10		16.7	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2009	Oct	12		39	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2010	Apr	4		31.7	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2010	Apr	6		17.2	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2010	Oct	2		60.5	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444
2011	Apr	3		63.3	Wheat, spring	80	New Pond	Spreader	Yes	30000	Custom		144	250	444

Fertilizer Application Plan

Year	Month	Field	Subfield	For Crop	Nutrient Activity	Source	Equipment/Method	Rate (/Ac)	N (/Ac)	P2O5 (/Ac)	K2O (/Ac)

Land Application Record Keeping

Record Keeping (Maintain for 5 years)

Maintain records to document plan implementation. As applicable, records include:

- ❑ Soil test results and recommendations for nutrient application.
- ❑ Quantities, analyses and sources of nutrients and manure applied.
- ❑ Dates and methods of nutrient and manure applications.
- ❑ Crops planted, planting and harvest dates, yields, and crop residues removed.
- ❑ Results of water, plant, and organic by-product analyses.
- ❑ Dates of review and person performing the review, and recommendations that resulted from the review.

Operation and Maintenance

a. Review the Manure and Nutrient Management Plan component annually and make adjustments when needed.
b. Calibrate application equipment to ensure uniform distribution and accurate application rates.
c. Inspect and repair manure hauling and application equipment to minimize potential of accidental spillage.
d. Protect fertilizer storage areas from weather to minimize runoff, leakage, and lost of material.
e. Avoid unnecessary exposure to fertilizer and organic waste (bio-solids), and wear protective clothing when necessary.
f. Observe set backs required for nutrient applications (specified in this plan) adjacent to water bodies, drainageways, sink holes, and other sensitive areas.
g. Maintain records of manure and nutrient applications for 5 years.
h. Clean up residual materials from equipment and dispose of properly.

Summary:

This Plan only applies to the fields and conditions stated in this Plan. If changes occur in your livestock operations or fields contact the local NRCS Office to get this Plan revised.

SECTION 7
Feed Management Considerations
Optional

Estimated Percent Reduction in Manure Quantity and Nutrients Due to Ration Amendments

Amendment	Water Dilution	N Production	P2O5 Production	K2O Production	Storage N Loss
Wet/Dry Feeding	50				
Phased Feeding		10	10	10	
Phytase			20		
Alum					25
HAP Corn			20		
HAP Soybean			20		

Approved By:

Signature_____ Date:_____
Name:
Title:

SECTION 8
Other Utilization Component

Chemicals and other contaminants such as herbicides, pesticides, insecticides, fungicides, and rodenticides, will be disposed of according to manufacturers' recommendations and will meet all local, state, and federal regulations. They will not be disposed of in the waste storage facility designed for the purpose of this plan.

Approved By:

Signature_____ Date:_____
Name:
Title:

SECTION 9
Manure Analysis Procedures

Liquid Manure (Dairy, Beef, Swine)

Obtain a composite following one of the procedures listed below and thoroughly mix. Using a plunger, an up-and-down action works well for mixing liquid manure in a five-gallon bucket. Fill a one-quart plastic bottle not more than three-quarters full with the composite sample. Store sample in freezer if not delivered to the lab immediately.

Procedure 1. Sampling from storage- Agitate storage facility thoroughly before sampling. Collect at least five samples from the storage facility or during loading using a five-gallon bucket. Place a sub sample of the composite sample in a one-quart plastic container. Sampling a liquid manure storage facility without proper agitation (2-4 hrs. minimum) is not recommended due to nutrient stratification, which occurs in liquid systems. If manure is sampled from a lagoon that was not properly agitated, typically the nitrogen and potassium will be more concentrated in the top liquid, while the phosphorus will be more concentrated in the bottom solids.

Procedure 2. Sampling during application- Place buckets around field to catch manure from spreader or irrigation equipment. Combine and mix samples into one composite sub sample in a one-quart plastic container.

Solid Manure (Dairy, Beef, Swine, Poultry)

Collect a composite sample by following one of the procedures listed below. A method for mixing a composite sample is to pile the manure and then shovel from the outside to the inside of the pile until well mixed. Fill a one-gallon plastic heavy-duty zip lock bag approximately one-half full with the composite sample, squeeze out excess air, close and seal. Store sample in freezer if not delivered to the laboratory immediately.

Procedure 1. Sampling while loading - *Recommended method for sampling from a stack or bedded pack.* Take at least ten samples while loading several spreader loads and combine to form one composite sample. Thoroughly mix the composite sample and take an approximately one pound sub sample using a one-gallon plastic bag. *Sampling directly from a stack or bedded pack is not recommended.*

Procedure 2. Sampling during spreading - Spread a tarp in field and catch the manure from one pass. Sample from several locations and create a composite sample. Thoroughly mix the composite sample together and take a one-pound sub sample using a one-gallon plastic bag.

Procedure 3. Sampling daily haul - Place a five-gallon bucket under the barn cleaner 4-5 times while loading a spreader. Thoroughly mix the composite sample together and take a one-pound sub sample using a one-gallon plastic bag. Repeat sampling 2-3 times over a period of time and test separately to determine variability.

Procedure 4. Sampling poultry in-house - Collect 8-10 samples from throughout the house to the depth the litter will be removed. Samples near feeders and waterers may not be indicative of the entire house and sub samples taken near here should be proportionate to their space occupied in the whole house. Mix the samples well in a five-gallon pail and take a one-pound sub sample, place it in a one-gallon zip lock bag.

Procedure 5. Sampling stockpiled litter - Take ten sub samples from different locations around the pile at least 18 inches below the surface. Mix in a five-gallon pail and place a one-pound composite sample in a gallon zip lock bag.

Sample Identification and Delivery

Identify the sample container with information regarding the farm, animal species and date. This information should also be included on the sample information sheet along with application method, which is important in determining first year availability of nitrogen.

Keep all manure samples frozen until shipped or delivered to a laboratory. Ship early in the week (Mon.-Wed.) and avoid holidays and weekends.

SECTION 10
Nutrient Application Equipment Calibration

Commercial Fertilizer Application Equipment Calibration:
The nitrogen applicator, the commercial broadcast spreaders, and corn planter will be set per the manufacturers recommendations then filled with a known amount and checked over known acreage. Adjustments will be made to achieve the planned rates.

Manure Application Equipment Calibration

Manure Spreader/Tanker Calibration
There are several methods that can be used to calibrate the application rate of a manure spreader. The two best methods are the load-area method and the plastic sheet method. It is desirable to repeat the calibration procedure 2 to 3 times and average the results to establish a more accurate calibration.

Before calibrating a manure spreader, the spreader settings such as splash plates should be adjusted so that the spread is uniform. Most spreaders tend to deposit more manure near the spreader than at the edge of the spread pattern. Overlapping can make the overall application more uniform. Calibrating application rates when overlapping is involved requires measuring the width of two spreads and dividing by two to get the effective spread width.

Calibration should take place annually or whenever manure is being applied from a different source or consistency.

Load-Area Method:
The load-area method is the most accurate and can be used for most types of manure handling. This method consists of determining the amount (volume or weight) of manure in a spreader and the total area over which it is applied. The most accurate method to determine the amount of manure in a spreader is to weigh the spreader when it is full of manure and again when it is empty (portable pad scales work well for this). The difference is the quantity of manure applied over the area covered. Spreader capacities listed by the manufacturers can be used to determine the amount of manure in the spreader. However care must be taken when using manufactures spreader capacities. Heaped loads, loading methods and manure type may vary considerably from what is listed by manufacturers of box and side delivery manure spreaders. Spreader capacities for liquid tankers are accurate provided the tanker is filled to the manufactures recommended levels, and no foam is present in the tank.

The area of spread is determined from measuring the length and width of the spread pattern. Measuring can be done with a measuring wheel, measuring tape or by pacing.

The application rate is calculated using the following formula:

$$\frac{\text{Spreader capacity (tons or gallons)} \times 43560 \text{ sq. ft/acre}}{\text{Distance traveled} \times \text{Spreading width}} = \text{Application Rate tons or Gallons/Acre}$$

Plastic Sheet Method:
The plastic sheet method can only be used with solid or semi-solid manure. This method of calibrating spreader application rates involves 1) cutting a plastic sheet to the specified dimensions (56 inches X 56 inches), 2) weighing the clean plastic sheet, 3) laying out the plastic sheet on the ground and driving the manure spreader (applying manure at a recorded speed and spreader setting) over the sheet, 4) weighing the plastic sheet with the manure on it, and 4) determine the net weight of the manure on the sheet (weight of manure and sheet - weight of the clean sheet), and 5) the net pounds of manure equals tons per acre applied.

When calibrating manure spreaders, all details regarding tractor speed and manure spreader settings and date(s) of each calibration should be recorded with manure application information, and directly on the equipment. Mark equipment to ensure a known application rate is applied each time the referenced tractor speed and spreader settings are used. Manure spreader settings can include such things as: fast and slow settings on some box spreaders, gate position on side delivery spreaders and splash plate position and fill levels on liquid tankers.

SECTION 11
Land Evaluation Data

Soil Loss Data:

Predicted Soil Loss (Erosion) – Planned System
See attached RUSLE report for soil loss information

Soils Data (Enter map unit, drainage, flood hazard, & hydrologic group in the table below)

Map Unit	Soil Name	Slope %
32C	Amesha	4 - 8
32D	Amesha	8 - 15
36C	Brocko	4 - 8
36D	Brocko	8 - 15
451C	Brodyk	4 - 8
451C	Quagle	4 - 8
451D	Quagle	8 - 15
453B	Amsterdam	0 - 4
453C	Amsterdam	4 - 8
51B	Quagle	0 - 4
852D	Cabba	8 - 15

Soils Data Descriptions
See Attach Soil Reports

Section 12
Farm Nutrient Budget
Crop nutrient utilization potential for land that can receive manure.

Starting Crop Year 2007 ***Number of Plan Years*** 5

Average Annual Nutrient Utilization

Crop	Acres	Nitrogen*	P2O5**	K2O**
Alfalfa	503.86		27,712	133,523
Wheat, spring	350.74	92,595	17,397	10,662

	Acres	Nitrogen*	P2O5**	K2O**
All Crops	854.60	92,595	45,109	144,185

Per Acre	Nitrogen*	P2O5**	K2O**
All Crops	108	53	169

Total Manure Quantity and Total Estimated Nutrients

Type Of Manure	Annual Collected	Units	Avail. N***	P2O5	K2O
Liquid Manure	3,395,000	Gal	30,555	28,179	50,246

	Avail. N***	P2O5	K2O
All Manure	30,555	28,179	50,246

	Avail. N***	P2O5	K2O
Nutrient Balance (Supplied By Manure - Crop Needs)	-62,040	-16,931	-93,939

	Avail. N***	P2O5	K2O

	Acres
Average Acres Needed To Utilize Available Manure P2O5 At Crop Removal	534

	Acres
Additional Acres Needed To Apply Manure At P2O5 Crop Removal	0

	Acres
Average Acres Needed To Utilize Available Manure N At Crop Need (All Crops)	282

	Acres

* Based on recommended nitrogen for the planned non-legumes and 150 lbs/ac/yr of nitrogen for the planned legumes.
** Based on crop removal rates.
*** Based on maximum nitrogen available the first year after application.

Soil Test Results

Field	Subfield	Test Yr	OM%	P	K	Mg	Ca	Units	Soil pH	CEC
1		1999	1.5	10	245			ppm	7.7	
2		1999	1.5	10	245			ppm	7.7	
3		1999	1.5	10	245			ppm	7.7	
4		1999	1.8	26	508			ppm	7.6	
5		1999	1.5	10	245			ppm	7.7	
6		1999	3.0	53	716			ppm	7.6	
7		1999	1.8	26	508			ppm	7.6	
8		1999	1.8	26	508			ppm	7.6	
9		1999	1.8	26	508			ppm	7.6	
10		1999	1.8	26	508			ppm	7.6	
11		1999	3.0	53	716			ppm	7.6	
12		1999	3.0	53	716			ppm	7.6	
13		1999	2.3	23	544			ppm	7.7	
14		1999	2.3	23	544			ppm	7.7	
15		1999	2.3	23	544			ppm	7.7	
16		1999	2.3	23	544			ppm	7.7	
17		1999	2.2	19	504			ppm	7.9	
18		1999	2.2	19	504			ppm	7.9	
19		1999	2.2	19	504			ppm	7.9	
20		1999	2.2	19	504			ppm	7.9	
21		1999	2.2	19	504			ppm	7.9	

Projected Soil P and K Levels

Plan Start Year 2006 ***Number of Plan Years*** 5

Field	Subfield	P At Start	P At End	K At Start	K At End	Units
1		10		245	109	ppm
2		10	12	245	170	ppm
3		10	11	245	168	ppm
4		26	28	508	463	ppm
5		10	12	245	229	ppm
6		53	55	716	671	ppm
7		26	28	508	492	ppm
8		26	28	508	492	ppm
9		26	28	508	492	ppm
10		26	28	508	492	ppm
11		53	55	716	700	ppm
12		53	55	716	700	ppm
13		23	25	544	528	ppm
14		23	25	544	528	ppm
15		23	12	544	437	ppm
16		23	12	544	437	ppm
17		19	21	504	488	ppm

18		19	7	504	368	ppm
19		19	7	504	368	ppm
20		19	7	504	368	ppm
21		19	21	504	485	ppm

Number of Years at Planned Nutrient Management to Reach 150 PPM Olsen

Note: After soils reach 150 ppm, nutrient management will need to be revised.

Field	Subfield	P At Start	Units	Years To Reach 150 ppm
6		53	ppm	242
11		53	ppm	242
12		53	ppm	242
4		26	ppm	310
7		26	ppm	310
8		26	ppm	310
9		26	ppm	310
10		26	ppm	310
13		23	ppm	317
14		23	ppm	317
17		19	ppm	327
21		19	ppm	327
2		10	ppm	350
5		10	ppm	350
3		10	ppm	700
1		10	ppm	Missing data
15		23	ppm	N/A
16		23	ppm	N/A
18		19	ppm	N/A
19		19	ppm	N/A
20		19	ppm	N/A

Planned Manure Exports

Not Applicable

SECTION 13
Record Keeping Component

- ❑ **Manure and Wastewater Storage and Handling**
- ❑ **Manure and Fertilizer Applications**
- ❑ **Crop History**

SECTION 13 - Record Keeping - Manure and Wastewater Storage and Handling - Record Keeping

Type and Number of Animals	Date	Date	Date	Date	Date	Date
1.	#	#	#	#	#	#
2.	#	#	#	#	#	#
3.	#	#	#	#	#	#
4.	#	#	#	#	#	#
5.	#	#	#	#	#	#

Type of Inspections Completed	Date	Date	Date	Date	Date	Date
1.	#	#	#	#	#	#
2.	#	#	#	#	#	#
3.	#	#	#	#	#	#
4.	#	#	#	#	#	#

Type of Repairs Completed	Date	Date	Date	Date	Date	Date
1.						
2.						
3.						
4.						

Type Manure or Waste Removed	Date	Amt.	Date	Amt.	Date	Amt.	Date	Amt.	Date	Amt.	Date	Amt.
1.												
2.												
3.												
4.												
5.												

Type of Manure Transported Off the Farm	Where	Date	Amount.	Where	Date	Amount.	Where	Date	Amount.
1.									
2.									
3.									
4.									

Comments / Notes:

SECTION 13 - Fertilizer and Manure Application Record

Name:

Field	Date	Manure or Fertilizer Type	Method of Application (Surface, Injected, Irrigated, Incorporated, etc.)	Ground Cover	% Soil Moisture	Rate of Application					Weather and Comments
						Rate Gallons or Tons /Acre	Acres Applied	N Lbs/Ac	P2O5 Lbs/Ac	K2O Lbs/Ac	

Comments / Notes:

HDPE LINER SPECIFICATIONS

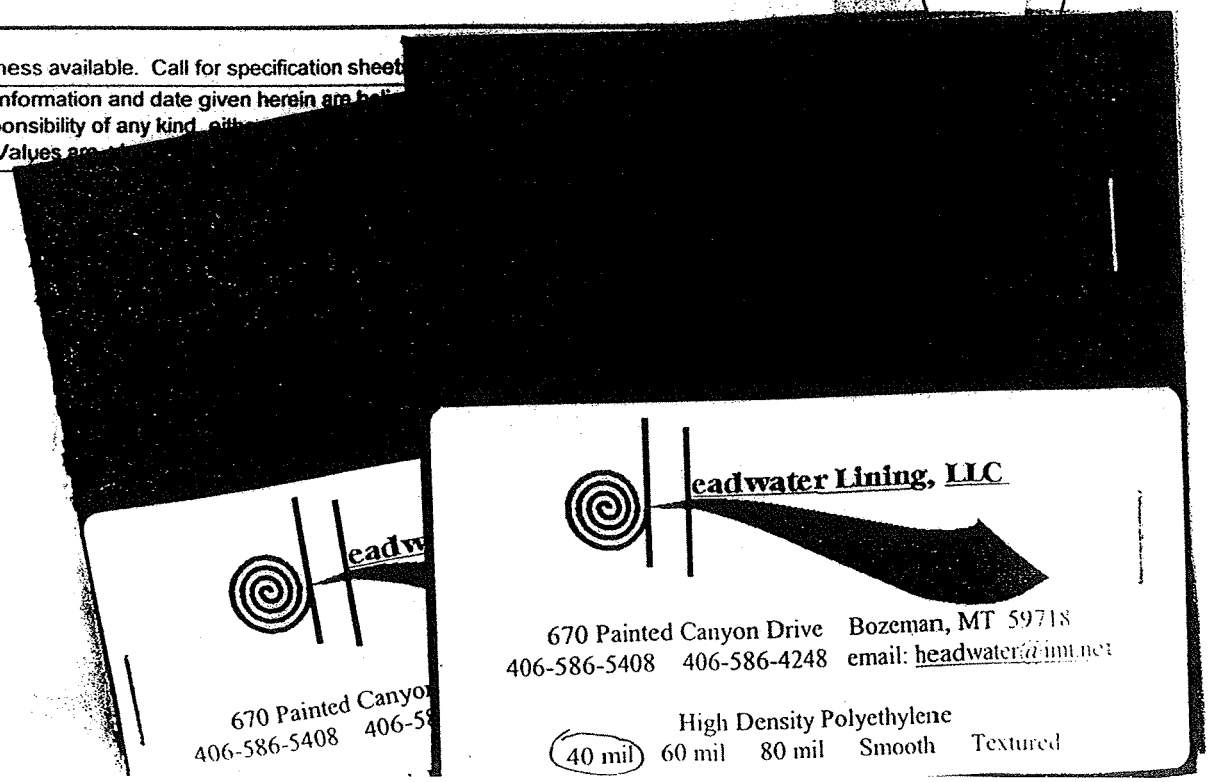
LINER SPECIFICATIONS

HDPE Geomembrane Specification Guide

Properties	Test Method	SMOOTH SHEET * 40	SMOOTH SHEET * 60	TEXTURED SHEET 40	TEXTURED SHEET 60
Thickness, mils	ASTM D-5199 (avg. min)				
Standard Roll Dimensions		22' x780'	22' x520'	22' x780'	22' x520'
Resin Density, g/cm3	ASTM D-1505	>.932	>.933	>.932	>.933
Melt Index, g/10min	ASTM D1238 (condition E)	<1	<1	<1	<1
Oxidation Induction Time, min	ASTM D-3895	>100	>100	>100	>100
Sheet Density, g/cm3	ASTM D-1505	>.940	>.940	>.940	>.940
Carbon Black Content, %	ASTM D-4218	2 to 3	2 to 3	2 to 3	2 to 3
Carbon Black Dispersion (category)	ASTM D-5596	1 or 2	1 or 2	1 or 2	1 or 2
Tensile Properties:	ASTM D-638				
Yield Strength, %	Type IV	15	22	15	22
Yield Elongation, %	(1.3in gage length)	12	12	12	12
Break Strength, %		27	40	11	16
Break Elongation,%	(2in gage length)	700	700	100	100
Tear Resistance, lbs	ASTM D-1004	125	187	125	187
Puncture Resistance, lbs	ASTM D-4833	320	480	267	400
Stress Crack Resistance, hrs	ASTM D5397 (appendice, SP-NCTL)	>200	>200	>200	>200
Oven Aging, %	ASTM D5721	55	55	55	55
UV Resistance, % (1/formulation)	GRI-GM11	50	50	50	50
Asperity Height, mil	GRI-GM12	n/a	n/a	>10	>10

* Other mil thickness available. Call for specification sheet

All statements, information and date given herein are b
warranty or responsibility of any kind, eith
specifications. Values are



POLY-FLEX LINER SPECIFICATIONS

INHERENT PROPERTIES OF POLYETHYLENE LINERS

The properties listed in the table below are primarily inherent on the resin type used to produce the liner or are directly proportional to the thickness of the liner and less dependent on the manufacturing method. Therefore, these properties will not change from roll to roll or even lot to lot. Hence, they should not be included as part of routine quality control testing. The exception to this is Oxidative Induction Time. This test is a measurement of the amount of anti-oxidant added to the resin to produce the finished sheet. This test can function both as a performance test and a quality control test. As a quality control test it is desirable to run the test at high temperatures to keep the test duration short. This test is routinely run at the time of manufacture. As a performance test it is desirable to run the test at lower temperatures. Testing at lower temperatures cannot be done for quality control purposes.

The information given below is based on nominal values. Individual test results may vary from these values depending upon the reproducibility of the test.

NOMINAL PROPERTIES

TEST DESCRIPTION	TEST METHOD	UNITS	HDPE	LLDPE
Modulus of Elasticity	ASTM D 6693	lb/in^2	110,000	45,000
Secant Modulus	ASTM D 5323	lb/in^2	60,000	45,000
Volatile Loss	ASTM D 1203	%	0.1	0.1
Dimensional Stability	ASTM D 1204	%	+/- 0.5	+/- 1.0
Water Absorption (24 hr @ 23 °C)	ASTM D 570	% change	0.1	0.1
Coefficient of Linear Thermal Expansion	ASTM D 696	(cm/cm • °c)	1.2×10^{-4}	1.4×10^{-4}
Moisture Vapor Transmission Rate (100 °F and 100% relative humidity)	ASTM E 96	g/m^2·day		
		100 mil	0.17	—
		80 mil	0.20	0.25
		60 mil	0.26	0.33
		40 mil	0.39	0.45
		30 mil	0.50	0.57
Low Temperature Brittleness	ASTM D 746	°F	<-112	<-112
Oxidative Induction Time	ASTM D 3895	minutes @ 200 °C	100	100
		minutes @ 150 °C	2000	2000
Multi-Axial Tension	ASTM D 5617	stress, lb/in^2	2200	1500
		strain, %	18	40+
Melt Index	ASTM D 1238	g/10 minutes	0.20	0.20

1. GENERAL REQUIREMENTS

1.1 Scope

The following describes parameters for the manufacture, supply, and installation of Poly-Flex polyethylene geomembranes. All procedures, operations, and methods shall be in strict accordance with the engineer's specifications, plans, and drawings.

1.2 Qualifications of Contractor Work Activities

1.2.1 Manufacturing

The manufacturer shall have at least five (5) years continuous experience in manufacturing polyethylene geomembrane and/or experience totaling 10,000,000 square feet of manufactured polyethylene geomembrane.

1.2.2 Installation

The installation contractor shall be the manufacturer or a dealer trained to install the manufacturer's geomembrane.

Installation shall be performed under the constant direction of a field installation supervisor who shall remain on site and be responsible, throughout the liner installation, for liner layout, seaming, testing, repairs, and all other activities by the Installer. The field installation supervisor shall have installed or supervised the installation of a minimum of 2,000,000 square feet of polyethylene geomembrane. Seaming shall be performed under the direction of a master seamer (who may also be the field installation supervisor) who has seamed a minimum of 2,000,000 square feet of polyethylene geomembrane, using the same type of seaming apparatus specified for this project. The field installation supervisor and/or master seamer shall be present whenever seaming is performed.

1.3 Submittals

1.3.1 Manufacturer

The manufacturer shall provide the following information:

A. Submittals with Bid Documents

1. List of material properties.
2. Manufacturing quality control program.

B. Submittals After Contract Award, Prior to Liner Installation

1. Copy of quality control certificates issued by the resin supplier.
2. Copy of quality control certificates for the geomembranes in conformance with Section 2.4.3.

1.3.2 Installation Contractor

The installer shall provide the following written information:

A. Submittals With Bid Documents

A list of completed facilities, totaling a minimum of 2,000,000 square feet, for which the installer has installed polyethylene geomembrane. For each installation, the following information shall be provided:

a. Name and purpose of facility, location, and date of installation.

b. Name of owner, design engineer, manufacturer, and name and telephone number of contact at

the facility who can discuss the project.

c. Thickness and quantity of the installed geomembrane.

B. Submittals by Successful Bidder Prior to Commencement of Installation

1. Proposed installation panel layout.
2. Resume of the field installation supervisor and master seamer.

1.4 Meeting

A daily meeting shall be held at the work area just prior to commencement of the work to discuss work activities. The earthwork contractor, the liner installer and the inspector shall be present.

1.5 Warranty

A written Warranty shall be obtained from the manufacturer (for material) and the installation contractor (for workmanship). These documents shall warrant both the quality of the material and workmanship for a specified duration of time.

2. MATERIAL SPECIFICATIONS

2.1 Materials

1. The geomembrane shall be High-Density Polyethylene (HDPE) or Linear Low Density Polyethylene (LLDPE).
2. Gasket material shall be neoprene, closed cell medium, 1/4-inch thick, 2 inches wide with adhesive on one side, or other compatible gasket materials as required.
3. Metal battens or banding and hardware shall be stainless steel.
4. Water cut-off mastic shall be Neoprene Flashing Cement as supplied by Poly-Flex, Inc., or as required.
5. Sealant shall be General Electric Silicone, RTV 103, or equivalent.

2.2 Geomembrane Raw Materials

The geomembrane shall be manufactured of polyethylene resins produced in the United States and shall be compounded and manufactured specifically for the intended purpose. The resin manufacturer shall certify each lot for the following properties.

The natural polyethylene resin without the carbon black shall meet the following requirements:

Property	Test Method	HDPE Requirements	LLDPE Requirements
Density, g/cc	ASTM D 1505 or ASTM D 792	0.935 - 0.940	0.915 - 0.926
Melt Index, g/10 min.	ASTM D 1238 Condition E	<0.4	<0.6

2.3 Rolls

The geomembrane shall be a minimum 23.0 ft seamless width, as manufactured by Poly-Flex, Inc. (2000 W. Marshall Dr., Grand Prairie, TX 75051, 888-765-9359). Carbon black shall be added to the resin if the resin is not compounded for ultra-

violet resistance.

The surface of the smooth geomembrane shall not have striations, roughness, pinholes, or bubbles.

The geomembrane shall be supplied in rolls. Labels on each roll shall identify the thickness of the material, the length and width of the roll, lot and roll numbers, and name of manufacturer.

Applicable Test Methods

American Society for Testing and Materials (ASTM)

ASTM D 792	Specific gravity (relative density) and density of plastics by displacement
ASTM D 1004	Initial tear resistance of plastic sheeting
ASTM D 1238	Flow rates of thermoplastics by extrusion plastometers
ASTM D 1505	Density of plastics by the Density-Gradient technique
ASTM D 1603	Carbon black in olefin plastics
ASTM D 1898	Sampling of plastics
ASTM D 3895	Test method for oxidative induction time of polyolefins by thermal analysis
ASTM D 4833	Index Puncture Resistance of geotextiles, geomembranes and related products
ASTM D 5199	Test method for measuring nominal thickness of geotextiles and geomembrane
ASTM D 5323	Determination of 2% secant modulus for polyethylene geomembranes
ASTM D 5397	Procedure to perform a single point notched constant tensile load - Appendix (SP-NCTL) test
ASTM D 5596	Test method for microscopic evaluation of the dispersion of carbon black in polyolefin geosynthetics
ASTM D 5617	Multi-axial tension test for geosynthetics
ASTM D 5721	Practice for air-oven aging of polyolefin geomembranes
ASTM D 5885	Test method for oxidative induction time of polyolefin geosynthetics by high pressure differential scanning calorimetry
ASTM D 5994	Test method for measuring the core thickness of textured geomembranes
ASTM D 6392	Determining the integrity of nonreinforced geomembrane seams produced using thermo-fusing methods
ASTM D 6693	Determining tensile properties of nonreinforced polyethylene and nonreinforced flexible polypropylene geomembranes

Geosynthetic Research Institute (GRI)

GRI GM 10	Specification for the stress crack resistance of geomembrane sheet
GRI GM 11	Accelerated weathering of geomembranes using a florescent UVA-condensation exposure device
GRI GM 12	Measurement of the asperity height of textured geomembranes using a depth gauge

The geomembrane rolls shall meet the following specifications:

40 mil

TEXTURED HDPE GEOMEMBRANE (ENGLISH UNITS)

Property	Test Method	Minimum Average Values 40 mil	60 mil	80 mil	100 mil
Thickness, mils	ASTM D 5994				
minimum average		38	57	76	95
lowest individual of 8 of 10 readings		36	54	72	90
lowest individual of 10 readings		34	51	68	85
Asperity Height[1], mils	GRI GM12	10	10	10	10
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940
Tensile Properties[2]	ASTM D 6693				
1. Yield Strength, lb/in		84	126	168	210
2. Break Strength, lb/in		60	90	120	150
3. Yield Elongation, %		12	12	12	12
4. Break Elongation, %		100	100	100	100
Tear Resistance, lb	ASTM D 1004	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	60	90	120	150
Stress Crack Resistance[3], hrs	ASTM D 5397 (App.)	300	300	300	300
Carbon Black Content[4], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	--Note 5--			
Oxidative Induction Time (OIT)					
Standard OIT, minutes	ASTM D 3895	100	100	100	100
Oven Aging at 85°C	ASTM D 5721				
Standard OIT - % retained after 90 days	ASTM D 3895	55	55	55	55
UV Resistance[6]	GRI GM11				
High Pressure OIT[7] - % retained after 1600 hrs	ASTM D 5885	50	50	50	50
Seam Properties	ASTM D 6392 (@ 2 in/min)				
1. Shear Strength, lb/in		80	120	160	200
2. Peel Strength, lb/in - Hot Wedge		60	91	121	151
- Extrusion Fillet		52	78	104	130
Roll Dimensions					
1. Width (feet):		23	23	23	23
2. Length (feet)		750	500	375	300
3. Area (square feet):		17,250	11,500	8,625	6,900
4. Gross weight (pounds, approx.)		3,500	3,500	3,470	3,470

1 Of the 10 readings; 8 must be ≥ 7 mils and lowest individual reading must be ≥ 5 mils.
2 Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
3 The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
4 Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
5 Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
6 The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

2.4 Quality Control Specifications

2.4.1 Raw Materials

A. Resin

All resins for use in geomembrane must pass a candidate pre-approval process before being eligible for use. Each incoming railcar shall be sampled by compartment with the following testing performed and compared to the manufacturer's specifications:

1. Density: ASTM D 1505.
2. Melt Index: ASTM D 1238.
3. Oxidative Induction Time (OIT): ASTM D 3895.

B. Additives

All incoming materials are to be tested and approved prior to use with the following testing performed and compared to the manufacturer's specifications:

1. Carbon Black Content: ASTM D 1603.
2. Oxidative Induction Time (OIT): ASTM D 3895.

2.4.2 Finished Product: During Production

A. Inspection

Performed on each roll during manufacturing.

1. Appearance

Sheet surface appearance shall be monitored for flaws.

2. Thickness

A full width sample shall be cut from the end of each roll for thickness measurement.

B. Roll Identification

Four tags per roll shall be used.

1. Outside the core.
2. On the core plug.
3. On the roll surface.
4. On the production roll sample.

C. Out-of-Spec. Material

Any roll not meeting the specification for any of the above inspections shall be separated from other rolls and placed on hold.

2.4.3 Manufacturer's Quality Control & Quality Assurance Testing

A. Sampling

Full width samples shall be taken as retains from the end of each roll to the manufacturer's laboratory.

B. Testing

The geomembrane quality control testing shall meet the following frequency requirements:

Property	Test Method	Testing Frequency (min.)
Thickness (smooth sheet) (textured sheet)	ASTM D 5199 ASTM D 5994	per roll
Asperity Height (textured sheet only) Alternate the measurement side for double-sided textured sheet.	GRI GM12	every second roll
Sheet Density	ASTM D 1505/D 792	200,000 lb (90,000 kg)
Tensile Properties 1. Yield Strength (HDPE only) 2. Break Strength 3. Yield Elongation (HDPE only) 4. Break Elongation	ASTM D 6693	20,000 lb (9,000 kg)
2% Modulus (LLDPE only)	ASTM D 5323	per each formulation
Tear Resistance	ASTM D 1004	45,000 lb (20,000 kg)
Puncture Resistance	ASTM D 4833	45,000 lb (20,000 kg)
Axi-Symetric Break Strain (LLDPE only)	ASTM D 5617	per each formulation
Stress Crack Resistance (HDPE only)	ASTM D 5397 (App.)	per GRI GM10
Carbon Black Content	ASTM D 1603	20,000 lb (9,000 kg)
Carbon Black Dispersion	ASTM D 5596	45,000 lb (20,000 kg)
Oxidative Induction Time (OIT) Standard OIT	ASTM D 3895	200,000 lb (90,000 kg)
Oven Aging at 85°C Standard OIT	ASTM D 5721 ASTM D 3895	per each formulation
UV Resistance High Pressure OIT	GRI GM11 ASTM D 5885	per each formulation

C. Welding Rod

A sample of welding rod shall be tested at the frequency of once per 25 rolls of welding rod. The following tests shall be performed on the sample:

1. Diameter	ASTM D 5199
2. Density	ASTM D 1505
3. Melt Index	ASTM D 1238
4. Carbon Black Content	ASTM D 1603

D. Reporting

Results from the testing shall be reviewed by the quality control manager. Material that does not meet specifications shall be identified and placed on hold. The test data shall then be transferred to the product data file for roll certification.

3. GEOMEMBRANE INSTALLATION

3.1 Materials Logistics

3.1.1 Transportation and On-site Storage

The geomembrane rolls shall be shipped by flatbed trailer to the job site. The geomembrane shall be stored so as to be protected from puncture, dirt, grease, moisture and excessive heat. Damaged material shall be stored separately for repair or replacement. The rolls shall be stored on a prepared smooth surface (not wooden pallets) and should not be stacked more than two rolls high.

3.2 Earthwork

3.2.1 General

The owner or his representative (soil quality assurance inspector) shall inspect the subgrade preparation. Prior to liner installation the subgrade shall be compacted in accordance with the project specifications. Weak or compressible areas which cannot be satisfactorily compacted should be removed and replaced with properly compacted fill. All surfaces to be lined shall be smooth, free of all foreign and organic material, sharp objects, or debris of any kind. The subgrade shall provide a firm, unyielding foundation with no sharp changes or abrupt breaks in grade. Standing water or excessive moisture shall not be allowed.

The installer, on a daily basis, shall approve the surface on which the geomembrane will be installed. After the supporting soil surface has been approved, it shall be the installer's responsibility to indicate to the inspector any changes to its condition that may require repair work.

3.2.2 Anchor Trench

The anchor trench shall be excavated to the line, grade, and width shown on the project construction drawings, prior to liner system placement. Slightly rounded corners shall be provided in the trench to avoid sharp bends in the geomembrane.

3.3 Method of Placement

The rolls shall be deployed using a spreader bar assembly attached to a loader bucket or by other methods approved by the project engineer.

The installer shall be responsible for the following:

1. Equipment or tools shall not damage the geomembrane during handling, transportation and deployment.
2. Personnel working on the geomembrane shall not smoke or wear damaging shoes.

3. The method used to unroll the panels shall not cause scratches or crimps in the geomembrane and shall not damage the supporting soil.
4. Adequate loading (e.g., sand bags or similar items that will not damage the geomembrane) shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

3.3.1 Weather Conditions

Geomembrane deployment shall proceed between ambient temperatures of 32° F and 104° F. Placement can precede below 32° F only after it has been verified by the inspector that the material can be seamed according to the specification. Geomembrane placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, rain, dew) or in the presence of excessive winds, as determined by the installation supervisor.

3.4 Field Seaming

Approved seaming processes are fusion and extrusion welding. On side slopes, seams shall be oriented in the general direction of maximum slope, i.e., oriented down, not across the slope. In corners and odd-shaped geometric locations, the number of field seams shall be minimized.

No base T-seam shall be closer than 5 feet from the toe of the slope. Seams shall be aligned with the least possible number of wrinkles and "fishmouths". If a fishmouth or wrinkle is found, it shall be relieved and cap-stripped.

3.4.1 Seam Overlap

Geomembrane panels must have a finished minimum overlap of 4 inches for fusion welding and 6 inches for extrusion welding.

Cleaning solvents may not be used unless the product is approved by the liner manufacturer.

3.4.2 Test Seams

Field test seams shall be conducted on the liner to verify that seaming conditions are satisfactory. Test seams shall be conducted at the beginning of each seaming period and at least once every 4 hours, for each seaming apparatus and personnel used that day.

All test seams shall be made in contact with the subgrade. Welding rod used for extrusion welding shall have the same properties as the resin used to manufacture the geomembrane. The test seam samples shall be 10 feet long for fusion welding and 3 feet long for extrusion welding with the seam centered lengthwise. Three specimens shall be cut from each end of the test seams by the inspector. The inspector shall use a tensiometer to test 3 specimens for shear and 3 specimens for peel. Each specimen shall be one inch wide with a grip separation of 4 inches plus the width of the seam. The seam shall be centered between the clamps. The rate of grip separation shall be 2 inches per minute.

3.4.3 Assessment of Seam Test Results

For both smooth and textured seams the strength of two out of three 1.0 inch (25 mm) wide strip specimens should meet or exceed values given in this specification. The third must meet or exceed 80% of the given values. The shear percent elongation should exceed 50%. The assumed gauge length is considered to be the unseamed sheet material on either side of the welded area. Elongation measurements should be omitted for field testing. In addition, the peel separation should not exceed 25% based on the proportion of area of separated bond to the area of the original bonding. Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in the ASTM D 6392. In this regard, SIP is an acceptable break code.

Unacceptable Break Codes

Hot Wedge: AD and AD-BRK > 25%

Extrusion Fillet: AD1, AD2 and AD-Weld (unless strength is achieved)

3.4.4 Non-Destructive Seam Testing

The installer shall non-destructively test all field seams over their full length.

A. Vacuum Box Testing

Equipment for testing extrusion seams shall be comprised of the following:

1. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.
2. Soapy solution in a plastic bucket with a mop.

The following procedures shall be followed by the installer:

1. Excess sheet overlap shall be trimmed away.
2. Wet a strip of geomembrane approximately 12 inches wide by the length of box with the soapy solution.
3. Place the box over the wetted area and compress.
4. Create a vacuum of 3 - 5 psi.
5. Ensure that a leak tight seal is created.
6. For a period of approximately 10 seconds, examine the geomembrane through the viewing window for the presence of animated soap bubbles.
7. If no animated bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap and repeat the process.
8. All areas where animated soap bubbles appear shall be marked, repaired and then retested.

The following procedures shall apply to locations where seams cannot be non-destructively tested.

1. If the seam is accessible to testing equipment prior to final installation, the seam shall be non-destructively tested prior to final installation.
2. If the seam cannot be tested prior to final installation, the seams shall be spark tested according to the spark tester manufacturer's procedures.

B. Air Pressure Testing (For Double Fusion Seams Only)

Equipment for testing double fusion seams shall be comprised of the following:

1. An air pump equipped with pressure gauge capable of generating and sustaining a pressure between 25 and 30 psi.
2. A pressure gauge equipped with a sharp hollow needle.

The following procedures shall be followed by the installer:

1. Seal one end of the seam to be tested.
2. Insert needle or other approved pressure feed device through the sealed end of the channel created by the double wedge fusion weld.
3. Energize the air pump to verify the unobstructed passage of air through the channel.
4. Seal the other end of the channel.

5. Energize the air pump to a pressure between 25 and 30 psi, close valve, allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for approximately 5 minutes.
6. If loss of pressure exceeds 4 psi, or pressure does not stabilize, locate faulty area, repair and retest.
7. If pressure does not drop below the acceptable value after five minutes, cut the air channel open at the opposite end from the pressure gauge. The air channel should deflate immediately indicating that the entire length of the seam has been tested.

3.4.5 Destructive Seam Testing

Destructive seam testing should be minimized to preserve the integrity of the liner. The installer shall provide the inspector with one destructive test sample per project specifications (usually once per 500 feet of seam length) from a location specified by the inspector.

A. Sampling Procedure

In order to obtain test results prior to completion of liner installation, samples shall be cut by the installer as the seaming progresses. The installer shall also record the date, location, and pass or fail description. All holes in the geomembrane resulting from obtaining the seam samples shall be immediately patched and vacuum tested.

B. Size and Disposition of Samples

The samples shall be 12 inches wide by 36 inches long with the seam centered lengthwise. The sample shall be cut into three equal-length pieces, one to be given to the inspector, one to be given to the owner and one to the installer.

C. Field Laboratory Testing

The inspector shall test ten 1-inch wide specimens from his sample, five specimens for shear strength and five for peel strength.

D. Independent Laboratory Testing

The owner, at his discretion and expense, may send seam samples to a laboratory for testing. The test method and procedures to be used by the independent laboratory shall be the same as used in field testing.

E. Procedures for Destructive Test Failure

The following procedures shall apply whenever a sample fails the field destructive test:

1. The installer shall cap strip the seam between the failed location and any passed test locations.
2. The installer can retrace the welding path to an intermediate location (usually 10 feet from the location of the failed test), and take a sample for an additional field test. If this test passes, then the seam shall be cap stripped between that location and the original failed location. If the test fails, then the process is repeated.
3. Over the length of seam failure, the installer shall either cut out the old seam, reposition the panel and reseam, or add a cap strip.

3.4.6 Defects and Repairs

All seams and non-seam areas of the geomembrane shall be inspected by the inspector for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection.

A. Evaluation

Each suspect location in seam and non-seam areas shall be non-destructively tested as appropriate in the presence of the inspector. Each location that fails the non-destructive testing shall be marked by the inspector, and repaired accordingly.

B. Repair Procedures

1. Defective seams shall be cap stripped or replaced.
2. Small holes shall be repaired by extrusion welding a bead of extrudate over the hole. If the hole is larger than 1/4 inch, it shall be patched.
3. Tears shall be repaired by patching. If the tear is on a slope or an area susceptible to stress and has a sharp end it must be rounded prior to patching.
4. Blisters, large cuts and undispersed raw materials shall be repaired by patches.
5. Patches shall be completed by extrusion welding. The weld area shall be ground no more than 10 minutes prior to welding. No more than 10% of the thickness shall be removed by grinding. Welding shall commence where the grinding started and must overlap the previous seam by at least 2 inches. Reseaming over an existing seam without regrinding shall not be permitted. The welding shall restart by grinding the existing seam and rewelding a new seam.

   Patches shall be round or oval in shape, made of the same geomembrane, and extend a minimum of 6 inches beyond the edge of defects.

C. Verification of Repairs

Each repair shall be non-destructively tested. Repairs that pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

The inspector shall keep daily documentation of all non-destructive and destructive testing. This documentation shall identify all seams that initially failed the test and include evidence that these seams were repaired and successfully retested.

3.5 Cover Material and Backfilling of Anchor Trench

The geomembrane shall be covered as soon as possible. The covering operation shall not damage the geomembrane. The cover soil material shall be free of foreign and organic material, sharp objects, or debris of any kind, which could potentially damage the geomembrane. No construction equipment or machinery shall operate directly on the geomembrane. The use of lightweight machinery (i.e., generator, etc.) with low ground pressure is allowed.

The anchor trench shall be backfilled by the earthwork contractor. Trench backfill material shall be placed and compacted in accordance with the project specifications.

Care shall be taken when backfilling the trenches to prevent any damage to the geomembrane. If damage occurs, it shall be repaired prior to backfilling.

3.6 Geomembrane Acceptance

The installer shall retain all ownership and responsibility for the geomembrane until accepted by the owner.

Final acceptance is when all of the following conditions are met:

1. Installation is finished.
2. Verification of the adequacy of all field seams and repairs, including associated testing, is complete.

NATURAL RESOURCE AND CONSERVATION SERVICE

SOILS MAPS AND TABLES

NRCS SOILS INFORMATION

DAIRYLAND FARMS INC.

NRCS Soils Map

Soil Map Legend

Gallatin County Area, Montana

Map Symbol	Soil Name
51B	Quagle silt loam, 0 to 4 percent slopes
451C	Quagle-brodyk silt loams, 4 to 8 percent slopes
451D	Quagle-brodyk silt loams, 8 to 15 percent slopes
453B	Amsterdam-quagle silt loams, 0 to 4 percent slopes

Distribution Generation Date: 1/22/2002

Non-Technical Descriptions

Gallatin County Area, Montana

Only those map units that have entries for the selected non-technical description categories are included in this report.

Map Unit: 51B - Quagle silt loam, 0 to 4 percent slopes

Description Category: SOI

QUAGLE SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A DARK COLORED SURFACE LAYER AND SLOPES OF 0-4 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.7-11.5; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Map Unit: 451C - Quagle-brodyk silt loams, 4 to 8 percent slopes

Description Category: SOI

QUAGLE SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A DARK COLORED SURFACE LAYER AND SLOPES OF 4-8 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.7-11.5; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Description Category: SOI

BRODYK SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A LIGHTER COLORED SURFACE LAYER AND SLOPES OF 4-8 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.6-11.1; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Map Unit: 451D - Quagle-brodyk silt loams, 8 to 15 percent slopes

Description Category: SOI

QUAGLE SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A DARK COLORED SURFACE LAYER AND SLOPES OF 8-15 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.7-11.5; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Description Category: SOI

BRODYK SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A LIGHTER COLORED SURFACE LAYER AND SLOPES OF 8-15 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.6-11.1; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Map Unit: 453B - Amsterdam-quagle silt loams, 0 to 4 percent slopes

Description Category: SOI

AMSTERDAM SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A DARK COLORED SURFACE LAYER AND SLOPES OF 0-4 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 10.3-11.8; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Non-Technical Descriptions - Continued

Gallatin County Area, Montana

Map Unit: 453B - Amsterdam-quagle silt loams, 0 to 4 percent slopes

Description Category: SOI

QUAGLE SILT LOAM IS MORE THAN 60 INCHES DEEP WITH A DARK COLORED SURFACE LAYER AND SLOPES OF 0-4 PERCENT. LANDFORM: RELICT STREAM TERRACES; FROST FREE DAYS: 90-110; AVAILABLE WATER CAPACITY IN INCHES: 9.7-11.5; MAJOR CONSIDERATIONS: NONE; LANDUSE MAY INCLUDE: CROPLAND, RANGELAND.

Table AWM-1. - Agricultural Waste Management

Gallatin County Area, Montana

The information in this table indicates the dominant soil condition, but does not eliminate the need for onsite investigation. The numbers in the value column range from 0.01 to 1.00. The larger the value, the greater the potential limitation. Limiting features in this report are limited to the top 5 limitations. Additional limitations may exist.

Map Symbol and Soil Name	Pct of Map Unit	Application of Manure and Food-Processing Waste		Application of Sewage Sludge		Disposal of Wastewater by Irrigation	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
51B:							
Quagle	85	Not limited		Not limited		Not limited	
451C:							
Quagle	70	Not limited		Not limited		Somewhat limited	
						Too steep for surface application	0.66
						Too steep for sprinkler application	<0.01
Brodyk	20	Not limited		Not limited		Somewhat limited	
						Too steep for surface application	0.66
						Too steep for sprinkler application	<0.01
451D:							
Quagle	60	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Too steep for surface application	1.00
						Too steep for sprinkler application	0.77
Brodyk	30	Somewhat limited		Somewhat limited		Very limited	
		Slope	0.63	Slope	0.63	Too steep for surface application	1.00
						Too steep for sprinkler application	0.77
453B:							
Amsterdam	60	Somewhat limited		Somewhat limited		Somewhat limited	
		Restricted permeability	0.50	Restricted permeability	0.37	Restricted permeability	0.37
Quagle	30	Not limited		Not limited		Not limited	

Table AWM-2. - Agricultural Waste Management

Gallatin County Area, Montana

The information in this table indicates the dominant soil condition, but does not eliminate the need for onsite investigation. The numbers in the value column range from 0.01 to 1.00. The larger the value, the greater the potential limitation. Limiting features in this report are limited to the top 5 limitations. Additional limitations may exist

Map Symbol and Soil Name	Pct of Map Unit	Overland Flow of Wastewater		Rapid Infiltration of Wastewater		Slow Rate Treatment of Wastewater	
		Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value	Rating Class and Limiting Features	Value
51B:							
Quagle	85	Very limited		Very limited		Not limited	
		Seepage	1.00	Restricted permeability	1.00		
451C:							
Quagle	70	Very limited		Very limited		Somewhat limited	
		Seepage	1.00	Restricted permeability	1.00	Too steep for surface application	0.66
		Too steep for surface application	<0.01	Slope	0.48	Too steep for sprinkler application	<0.01
Brodyk	20	Very limited		Very limited		Somewhat limited	
		Seepage	1.00	Restricted permeability	1.00	Too steep for surface application	0.66
		Too steep for surface application	<0.01	Slope	0.48	Too steep for sprinkler application	<0.01
451D:							
Quagle	60	Very limited		Very limited		Very limited	
		Seepage	1.00	Slope	1.00	Too steep for surface application	1.00
		Too steep for surface application	1.00	Restricted permeability	1.00	Too steep for sprinkler application	1.00
Brodyk	30	Very limited		Very limited		Very limited	
		Seepage	1.00	Slope	1.00	Too steep for surface application	1.00
		Too steep for surface application	1.00	Restricted permeability	1.00	Too steep for sprinkler application	1.00
453B:							
Amsterdam	60	Very limited		Very limited		Somewhat limited	
		Seepage	1.00	Restricted permeability	1.00	Restricted permeability	0.26
Quagle	30	Very limited		Very limited		Not limited	
		Seepage	1.00	Restricted permeability	1.00		

Table H. - Engineering Index Properties

Gallatin County Area, Montana

Absence of an entry indicates that the data were not estimated.

Map Symbol and Soil Name	Depth	USDA Texture	Classification		Fragments		Percent Passing Sieve Number				Liquid Limit	Plasticity Index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				Pct	Pct					Pct	
51B:												
Quagle	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-9	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	25-30	5-10
	9-60	Silt Loam	CL-ML ML	A-4	0	0	100	95-100	90-95	80-90	20-30	NP-10
451C:												
Quagle	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-9	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	25-30	5-10
	9-60	Silt Loam	CL-ML ML	A-4	0	0	100	95-100	90-95	80-90	20-30	NP-10
Brodyk	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-30	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	20-25	5-10
	30-60	Very Fine Sandy Loam Silt Loam	CL-ML	A-4	0	0	100	95-100	90-95	80-90	20-25	5-10
451D:												
Quagle	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-9	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	25-30	5-10
	9-60	Silt Loam	CL-ML ML	A-4	0	0	100	95-100	90-95	80-90	20-30	NP-10
Brodyk	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-30	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	20-25	5-10
	30-60	Very Fine Sandy Loam Silt Loam	CL-ML	A-4	0	0	100	95-100	90-95	80-90	20-25	5-10
453B:												

Table H. - Engineering Index Properties - Continued

Gallatin County Area, Montana

Map Symbol and Soil Name	Depth	USDA Texture	Classification		Fragments		Percent Passing Sieve Number				Liquid Limit	Plasticity Index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				Pct	Pct					Pct	
453B:												
Amsterdam	0-8	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-95	25-30	5-10
	8-15	Very Fine Sandy Loam Silt Loam Silty Clay Loam	CL CL-ML	A-4 A-6	0	0	100	100	95-100	80-95	25-35	5-15
	15-42	Very Fine Sandy Loam Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	25-30	5-10
	42-60	Very Fine Sandy Loam Silt Loam	CL-ML ML	A-4	0	0	100	100	95-100	70-90	20-30	NP-10
Quagle	0-6	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	75-85	25-30	5-10
	6-9	Silt Loam	CL-ML	A-4	0	0	100	100	95-100	80-90	25-30	5-10
	9-60	Silt Loam	CL-ML ML	A-4	0	0	100	95-100	90-95	80-90	20-30	NP-10

Distribution Generation Date: 1/22/2002

Table J1a. - Physical Properties of the Soils

Gallatin County Area, Montana

Entries under "Erosion Factors--T" apply to the entire profile. Entries under "Wind Erodibility Group" and "Wind Erodibility Index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.

Map Symbol and Soil Name	Depth	Sand	Silt	Clay	Moist Bulk Density	Saturated Hydraulic Conductivity	Available Water Capacity	Linear Extensibility	Organic Matter	Erosion Factors			Wind Erodibility	Wind Erodibility Group
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct	Kw	Kf	T	bility	bility
51B:														
Quagle	0-6	---	---	18-25	1.10-1.30	4.00-14.00	0.18-0.20	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-9	---	---	18-25	1.15-1.35	4.00-14.00	0.16-0.19	0.0-2.9	1.0-2.0	.37	.37			
	9-60	---	---	10-18	1.20-1.40	4.00-14.00	0.16-0.19	0.0-2.9	0.0-1.0	.37	.37			
451C:														
Quagle	0-6	---	---	18-25	1.10-1.30	4.00-14.00	0.18-0.20	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-9	---	---	18-25	1.15-1.35	4.00-14.00	0.16-0.19	0.0-2.9	1.0-2.0	.37	.37			
	9-60	---	---	10-18	1.20-1.40	4.00-14.00	0.16-0.19	0.0-2.9	0.0-1.0	.37	.37			
Brodyk	0-6	---	---	18-22	1.10-1.30	4.00-14.00	0.17-0.19	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-30	---	---	10-18	1.15-1.35	4.00-14.00	0.17-0.19	0.0-2.9	0.5-2.0	.37	.37			
	30-60	---	---	10-18	1.20-1.40	4.00-14.00	0.15-0.18	0.0-2.9	0.0-0.5	.37	.37			
451D:														
Quagle	0-6	---	---	18-25	1.10-1.30	4.00-14.00	0.18-0.20	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-9	---	---	18-25	1.15-1.35	4.00-14.00	0.16-0.19	0.0-2.9	1.0-2.0	.37	.37			
	9-60	---	---	10-18	1.20-1.40	4.00-14.00	0.16-0.19	0.0-2.9	0.0-1.0	.37	.37			
Brodyk	0-6	---	---	18-22	1.10-1.30	4.00-14.00	0.17-0.19	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-30	---	---	10-18	1.15-1.35	4.00-14.00	0.17-0.19	0.0-2.9	0.5-2.0	.37	.37			
	30-60	---	---	10-18	1.20-1.40	4.00-14.00	0.15-0.18	0.0-2.9	0.0-0.5	.37	.37			
453B:														
Amsterdam	0-8	---	---	20-27	1.10-1.30	4.00-14.00	0.18-0.20	0.0-2.9	2.0-4.0	.32	.32	5	6	48
	8-15	---	---	18-30	1.20-1.40	1.40-4.00	0.17-0.20	0.0-2.9	1.0-2.0	.43	.43			
	15-42	---	---	18-27	1.25-1.45	1.40-4.00	0.17-0.20	0.0-2.9	0.5-1.0	.43	.43			
	42-60	---	---	10-20	1.25-1.50	4.00-14.00	0.17-0.19	0.0-2.9	0.0-0.5	.43	.43			

Distribution Generation Date: 1/22/2002

Table J1a. - Physical Properties of the Soils - Continued

Gallatin County Area, Montana

Map Symbol and Soil Name	Depth Index	Sand	Silt	Clay	Moist Bulk Density	Saturated Hydraulic Conductivity	Available Water Capacity	Linear Extensibility	Organic Matter	Erosion Factors Kw	Erosion Factors Kf	Erosion Factors T	Wind Erodibility	Wind Erodibility Group
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
453B:														
Quagle	0-6	---	---	18-25	1.10-1.30	4.00-14.00	0.18-0.20	0.0-2.9	1.0-3.0	.37	.37	5	4L	86
	6-9	---	---	18-25	1.15-1.35	4.00-14.00	0.16-0.19	0.0-2.9	1.0-2.0	.37	.37			
	9-60	---	---	10-18	1.20-1.40	4.00-14.00	0.16-0.19	0.0-2.9	0.0-1.0	.37	.37			

Table K1. - Water Features

Gallatin County Area, Montana

Depths of layers are in feet. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.

Map Symbol and Soil Name Frequency	Hydrologic Group	Month	Water Table			Ponding		Flooding		
			Upper Limit Ft	Limit Limit Ft	Lower Depth Ft	Limit	Surface	Duration	Frequency	Duration
51B:										
Quagle	B	Jan-Dec			---	---	None	---	None	
451C:										
Quagle	B	Jan-Dec			---	---	None	---	None	
Brodyk	B	Jan-Dec			---	---	None	---	None	
451D:										
Quagle	B	Jan-Dec			---	---	None	---	None	
Brodyk	B	Jan-Dec			---	---	None	---	None	
453B:										
Amsterdam	B	Jan-Dec			---	---	None	---	None	
Quagle	B	Jan-Dec			---	---	None	---	None	

Table Y. - Prime Farmland

Gallatin County Area, Montana

Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parenthesis after the soil name.

Map Symbol	Soil Name
51B	Quagle silt loam, 0 to 4 percent slopes (Prime farmland if irrigated)
453B	Amsterdam-quagle silt loams, 0 to 4 percent slopes

Dairyland Farms Inc.

Gallatin County Area, Montana

The information in this table indicates the dominant soil condition, but does not eliminate the need for onsite investigation. Limiting features in this report are limited to the top 5 limitations. Additional limitations may exist.

Map Symbol and Soil Name	Pct of Map Unit	AWM - Irrigation Disposal of Wastewater Rating Class and Limiting Features	Value
51B:			
Quagle	85	Not limited	
451C:			
Quagle	70	Somewhat limited	
		Too steep for surface application	0.66
		Too steep for sprinkler application	<0.01
Brodyk	20	Somewhat limited	
		Too steep for surface application	0.66
		Too steep for sprinkler application	<0.01
451D:			
Quagle	60	Very limited	
		Too steep for surface application	1.00
		Too steep for sprinkler application	0.77
Brodyk	30	Very limited	
		Too steep for surface application	1.00
		Too steep for sprinkler application	0.77
453B:			
Amsterdam	60	Somewhat limited	
		Restricted permeability	0.37
Quagle	30	Not limited	

Selected Soil Interpretations

Gallatin County Area, Montana

The information in this table indicates the dominant soil condition, but does not eliminate the need for onsite investigation. Limiting features in this report are limited to the top 5 limitations. Additional limitations may exist.

ENG - Sewage Lagoons

Map Symbol and Soil Name	Pct of Map Unit	Rating Class and Limiting Features	Value
51B:			
Quagle	85	Somewhat limited	
		Seepage	0.50
		Slope	<0.01
451C:			
Quagle	70	Somewhat limited	
		Slope	0.91
		Seepage	0.50
Brodyk	20	Somewhat limited	
		Slope	0.91
		Seepage	0.50
451D:			
Quagle	60	Very limited	
		Slope	1.00
		Seepage	0.50
Brodyk	30	Very limited	
		Slope	1.00
		Seepage	0.50
453B:			
Amsterdam	60	Somewhat limited	
		Seepage	0.50
		Slope	<0.01
Quagle	30	Somewhat limited	
		Seepage	0.50
		Slope	<0.01

WELL LOGS

WELL LOGS

ROUTE ONE
BOZEMAN, MONTANA

POTTS DRILLING CO.

TELEPHONE
586-6812

Name Delbert Kammerman

Street Manhattan, Montana

Town

Location

1/4 1/4 Sec. Twp Rng

Start 10-2-74 Finish 10-8-74

Size 6" Weight 17#

Driller

Rig

From / To	Formation	Water
0 / 20	Clay	
20 / 38	Hardpan	
38 / 52	sands and sm. gravel	
52 / 75	dirty claybound gravels	
75 / 103	sandstone grey for 5 ft. then lightens	
103 / 126	sand and gravel cemented	
126 / 175	sanstone bleeds very little water	
175 / 176	sand with small sandstone	
176 / 179	fine clean sands	

Remarks:

CASING LOG

#	Length	Total
	Total Drilling	
	Total Casing	
	Shoe at	
	Bailed at	
	Draw Down	
	2 ft. 4" Casing above ground	
	Shoe at	176 ft.
	5 ft. .030 S.S. Screen set from 175-180 feet	
	Static Water Level 110 ft.	
	Pumped @	40 g.p.m.
	for 1 hour	

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is complied electronically from the contents of the Ground-Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Plot this site on a topographic map

Site Name: KAMERMAN NELSON
GWIC Id: 183363

Section 1: Well Owner

Owner Name
KAMERMAN NELSON
Mailing Address
8057 CHURCHILL ROAD

City	State	Zip Code
MANHATTAN	MT	59741

Section 2: Location

Township	Range	Section	Quarter Sections
01S	03E	36	NW¼ NE¼

County
GALLATIN
Geocode

Latitude	Longitude	Geomethod	Datum
45.7127	111.2963	TRS-TWN	NAD27

Addition **Block** **Lot**

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY

Section 5: Well Completion Date
Date well completed: Wednesday, July 05, 2000

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	303	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-1.5	257	6	0.250		WELDED	STEEL
243	303	4		160.00		PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
263	303	4		3/8	DRILLED HOLES

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	BENTONITE	Y

Section 7: Well Test Data

Total Depth: 303
Static Water Level: 173
Water Temperature:

Air Test *

12 gpm with drill stem set at 290 feet for 1 hours.
Time of recovery _ hours.
Recovery water level 173 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

From	To	Description
0	2	TOPSOIL
2	36	CLAYS AND GRAVEL
36	141	SAND AND GRAVEL
141	203	CLAYBOUND GRAVEL
203	231	SAND
231	236	GRAVEL AND WHITE ROCK
236	303	HARD CLAY

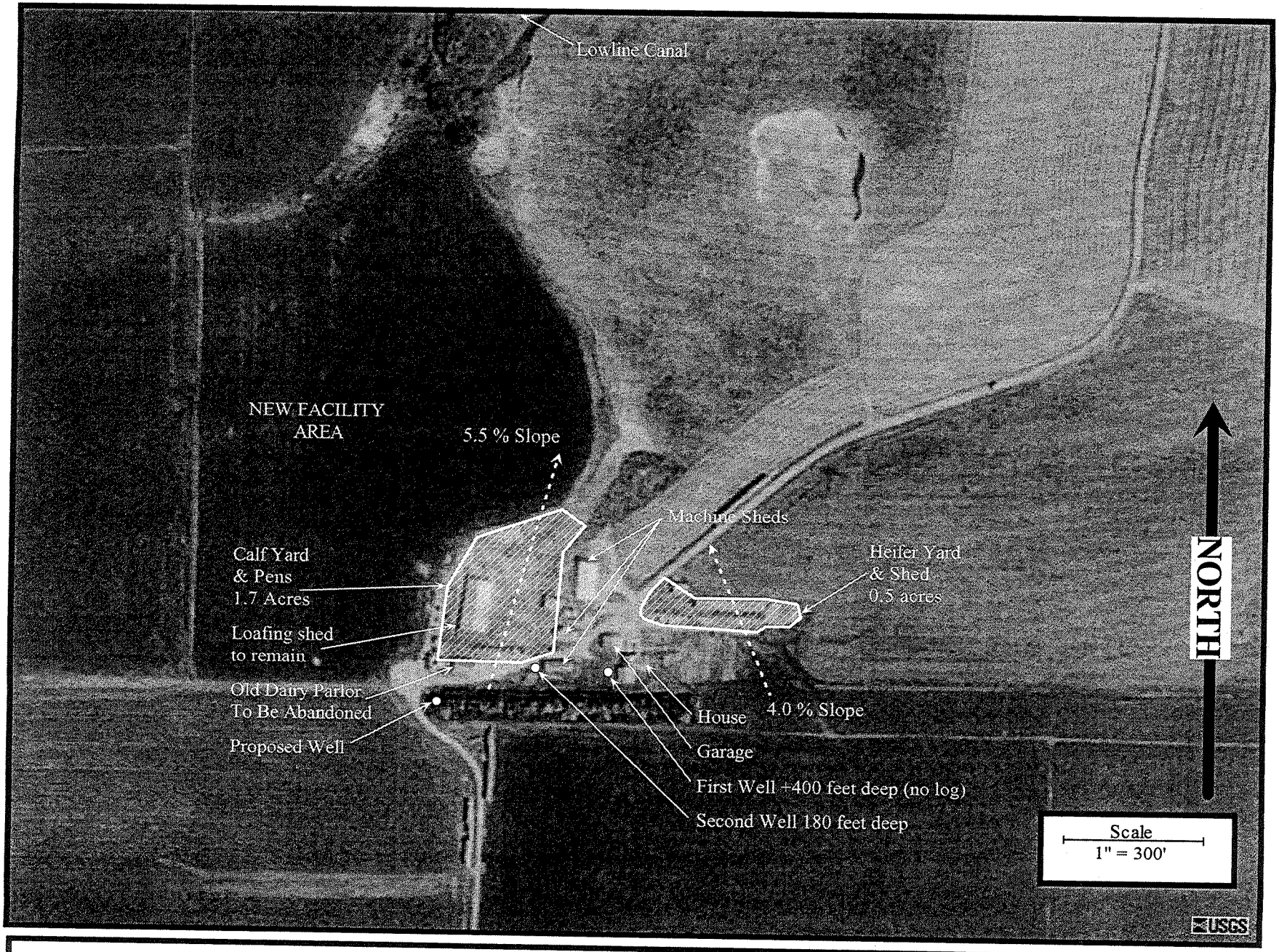
Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: VAN DYKEN
License No: WWC-380
Date Completed: 7/5/2000

FIGURES & SHEETS

FIGURES



DAIRYLAND FARMS INC.
Existing Features